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Diversity and structure of scorpion fauna from arid ecosystem in Algerian Septentrional Sahara (2005-2018)

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Abstract

The present work is a study of composition and structure of scorpion fauna in the region of Ouargla (Eastern Algerian Sahara), during a period of fourteen years from 2005 to 2018, we sampled from different biotopes more than 1550 adult specimens, divided into nine 9 species of scorpions: *Androctonus amoreuxi*, *Androctonus australis*, *Buthacus arenicola*, *Buthacus samiae*, *Buthiscus bicalcaratus*, *Buthus saharicus*, *Buthus tunetanus*, *Orthochirus innesi*, and *Scorpio punicus*. *A. australis* was the most abundant species with 47.36% of the total individuals captured. Other species such as *S. punicus*, *B. arenicola* and *A. amoreuxi* are ranked as accidental with rates less than 20%. Among the important results in this work is reporting for the first time the presence of *B. bicalcaratus* in Ouargla and the new records of *B. samiae* and *B. saharicus* in this area. The Shannon's index was H' = 2.05 and the evenness index was 0.65, showing a very important diversity of scorpions with more than 23.5% of scorpion species reported in Algeria; however, a poor balance between the number of sampled species with dominance of the thermophilic species that are the most adapted scorpions in this arid climate.

Keywords: Scorpions, species, arid ecosystem, Septentrional Sahara, Algeria.

Introduction

Algeria, with its enormous geographical extent and various ecosystems, is inhabited with more than 38 species of scorpions (Sadine, 2018a) that represent more than 1.7% of the global richness of scorpions (Stockmann, 2015). The Algerian Sahara occupies more than 3/4 of the total surface of the country (Côte, 1996), with very

restrictive climatic for the survive of desert living beings (Chehma *et al.*, 2005) such as scorpions (Sadine, 2005; Sadine *et al.*, 2011; Sadine, 2012; Sadine, 2018b), that considered typical representatives of the wildlife of hot deserts (Sahara) (Goyffon & El Ayeb, 2002).

Scorpion fauna in the northern Algerian Sahara are little explored, except some general contributions on scorpions from North Africa: Vachon (1952) and El-Hennawy (1992) and some other recent studies on scorpions in very limited areas: El-Oued (Sadine *et al.*, 2011; Sadine, 2012; Sadine, 2018b), Ghardaïa (Sadine *et al.*, 2014; Lourenço & Sadine, 2014; Lourenço & Sadine, 2015; Lourenço *et al.*, 2015; Sadine *et al.*, 2016; Lourenço *et al.*, 2016; Lourenço *et al.*, 2017; Sadine, 2018b) and Ouargla (Sadine, 2005; Sadine & Idder, 2009; Idder *et al.*, 2012; Sadine, 2012).

In fact, the main goal of the current study is placed within the perspective of scorpion biodiversity assessment of Ouargla province (Algeria) and to understand the structure and diversity indices of the scorpion community by exploiting the results of 14 years of sampling between 2005 to 2018.

Material and Methods

Study area

The province of Ouargla (28°28'-33°37'N, 3°04'-9°34'E) (Fig. 1) with more than 212000 km^2, has a similar climate to the Algerian northern Sahara, submitted to an extreme form of the Mediterranean climate, where rains always occur in winter with low rainfall between 50 to 100 mm per annum (Le Houerou, 1990); with intense brightness, strong evaporation and wide temperature differences with the dryness of the air (Rouvillois-Brigol, 1975). The climate of the study area is typically arid (Saharan bioclimatic stage) with mild winter, characterized by high maximum temperature that can exceed 40°C (Sadine, 2012). The meteorological data of the period 2005-2014 (Fig. 2) shows that drought period spans almost all year from February to December.

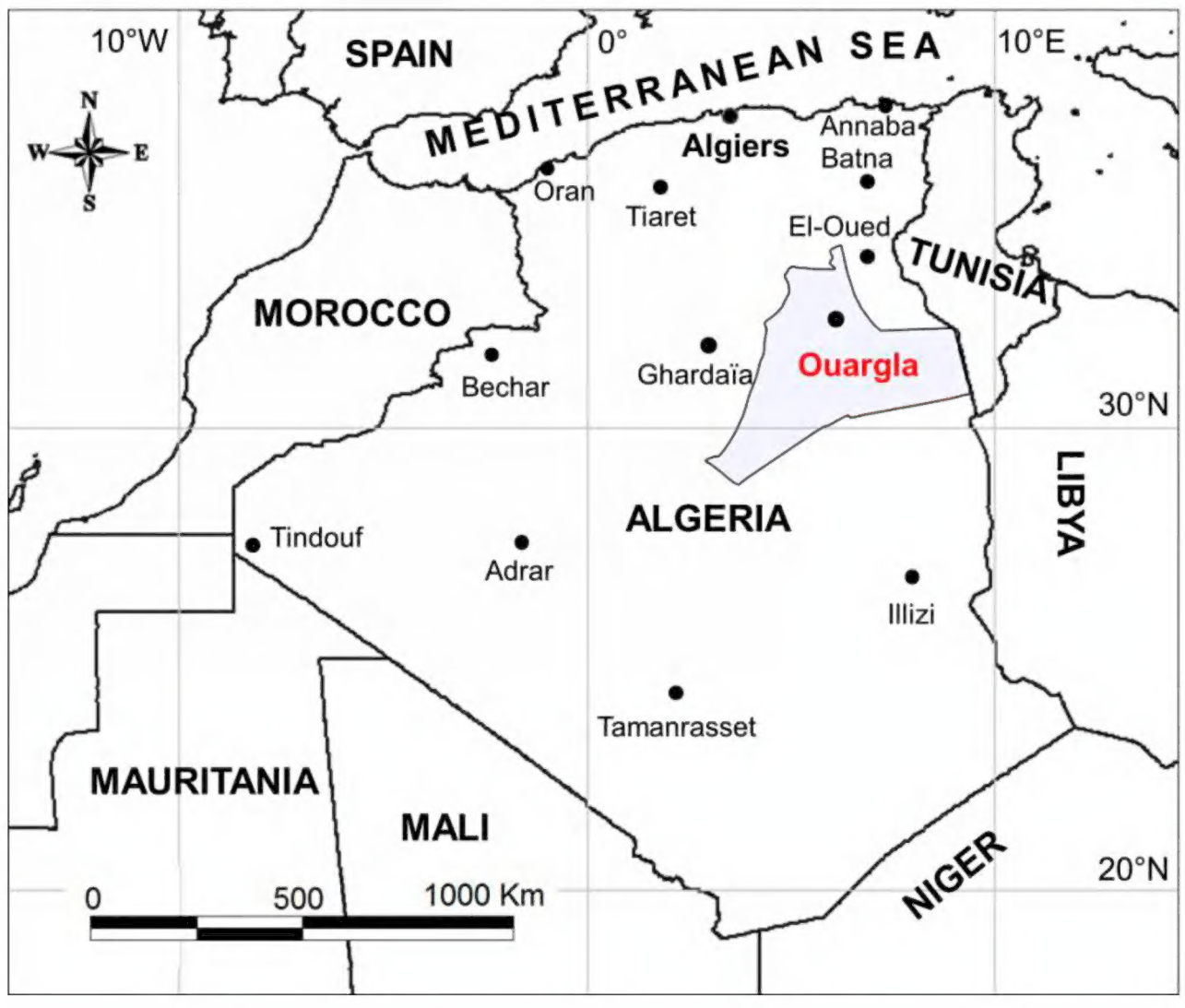

Fig. 1. Map of Algeria, showing the region of Ouargla.

Sampling and identification of scorpions

Specimens of scorpions were collected from different biotopes: palm groves, urban environments, ergs, regs, and Sebkha. In this study, only adult individuals are used for identification, after having killed them and kept in 70% alcohol. Identification was obtained using a stereo-microscope as described by Vachon (1974).

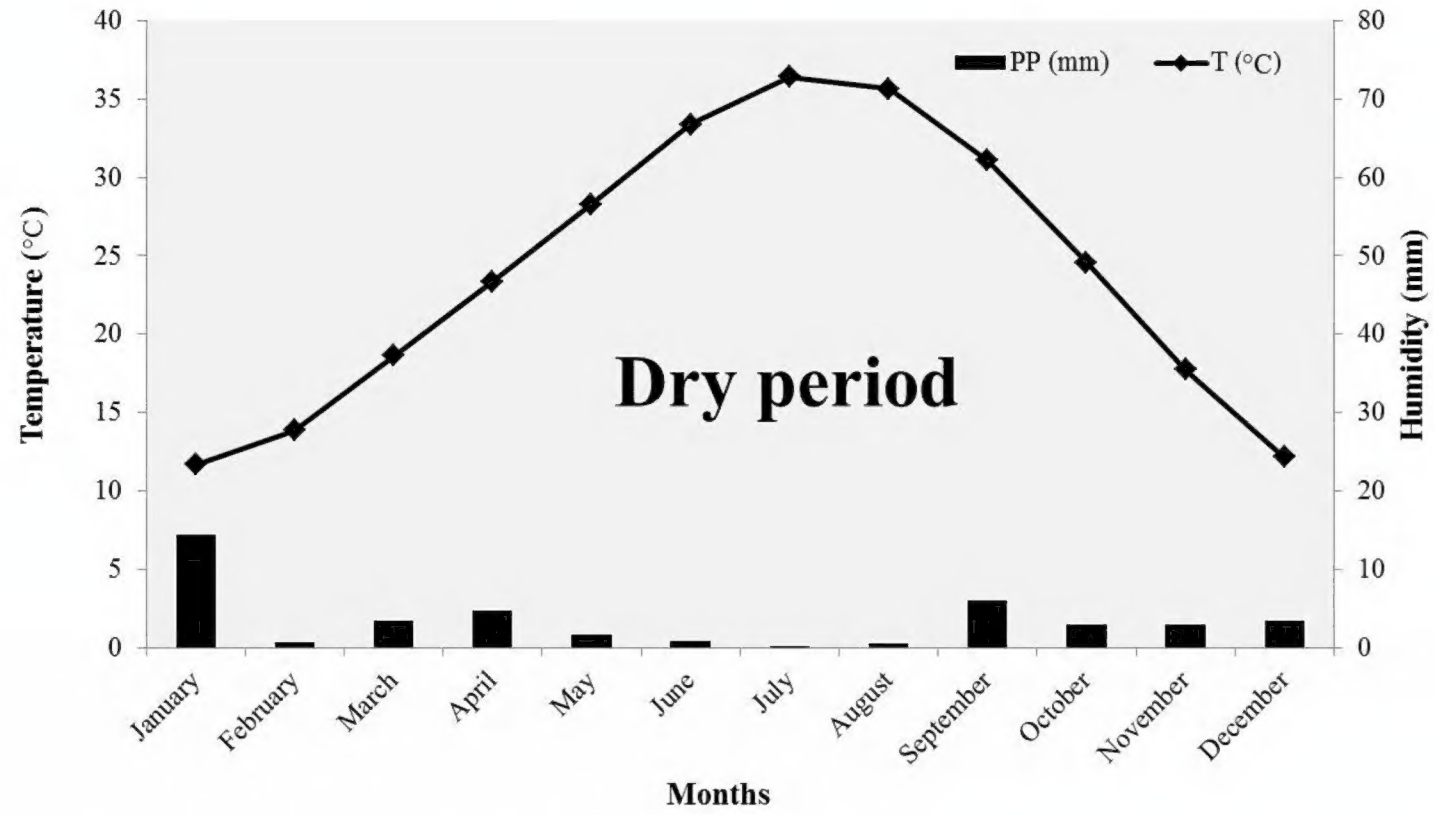

Fig. 2. Ombrothermic diagram of Bagnouls and Gaussen (Ouargla: 2005-2014).

Ecological Indices

To explain the composition of the scorpion fauna, we used the species richness (S) and the relative abundance (RA) determined as the ratio of the number of individuals for each species divided over the total number of individuals recorded (1552). However, Shannon's index ($H' = - \sum pi \times Log_2 pi$) and evenness ($E = H'/log_2 S$) were applied for measuring scorpion diversity (structure) in this period of 14 years (2005-2018) based on the relative density ***pi*** of the **"*i*"** species (Magurran, 2004).

Results and Discussion

Taxonomic and scorpion composition

Species richness

During a period of fourteen years, 2005-2018, we collected and examined 1552 adult scorpion individuals from different locations in the Ouargla region. Based on morphological and morphometric criteria, sampled individuals belong to two families; Buthidae contains 8 species distributed in 5 genera: *Androctonus*, *Buthacus*, *Buthiscus*, *Buthus*, and *Orthochirus* while Scorpionidae family is represented only by genus *Scorpio*.

The list of scorpion species in the region of Ouargla is composed of 9 species (Fig. 3). Data of the three works of 2005, 2012 and 2018 (Sadine, 2005, 2012, 2018b) are presented by taxonomic orders in Table (1).

According to Table (1), we can note that 5 species: *A. amoreuxi*, *A. australis*, *B. arenicola*, *B. tunetanus* and *O. innesi* are constant during the fourteen years of prospecting, which are the species reported in several works as specific species for Northern Sahara (Sadine *et al.*, 2011; Sadine, 2012, 2018b).

Table 1. Systematic list of scorpion species captured in Ouargla province (Algerian Septentrional Sahara) between 2005-2018.

Family	**Genus**	**Species**	**2005**	**2012**	**2018**
Buthidae	*Androctonus*	*A. amoreuxi* (Audouin, 1825)	+	+	+
		A. australis (Linnaeus, 1758)	+	+	+
	Buthacus	*B arenicola* (Simon, 1885)	+	+	+
		B. samiae Lourenço & Sadine, 2015	-	-	+
	Buthiscus	*B. bicalcaratus* Birula, 1905	-	-	+
	Buthus	*B. tunetanus* (Herbst, 1800)	+	+	+
		B. saharicus Sadine, Bissati & Lourenço, 2016	-	-	+
	Orthochirus	*O. innesi* (Simon, 1910)	+	+	+
Scorpionidae	*Scorpio*	*S. punicus* Fet, 2000	-	+	+
Total	6 genera	9 species	5	6	9
+ : Present - : Absent					

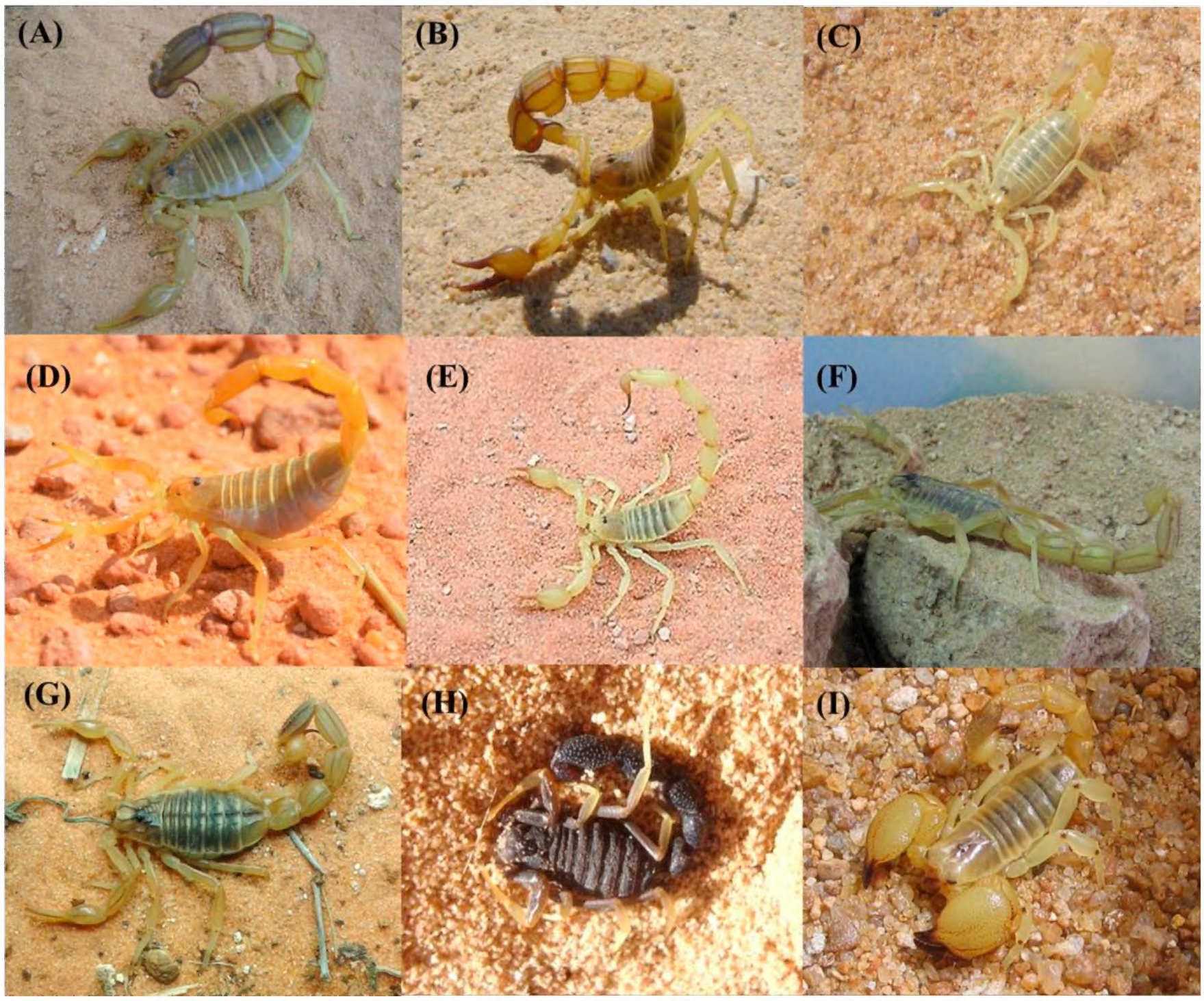

Fig. 3. Photographs of the collected scorpions of Ouargla: (A) *Androctonus amoreuxi*, (B) *Androctonus australis*, (C) *Buthacus arenicola*, (D) *Buthacus samiae*, (E) *Buthiscus bicalcaratus*, (F) *Buthus tunetanus*, (G) *Buthus saharicus*, (H) *Orthochirus innesi* and (I) *Scorpio punicus*.

The species *S. punicus* was not reported in 2005 (Sadine, 2005), because it is a burrowing scorpion (Vachon, 1952); it probably escaped from sampling. However, the

two species *B. samiae* and *B. saharicus* are recently identified in the Ghardaïa region, their presence in the region of Ouargla is reported for the first time.

The species *B. bicalcaratus* was reported as a desert species (Vachon, 1952). Its presence in the Algerian northern Sahara remains very limited in the region of Souf Est-Algerien (Sadine *et al.*, 2011; Sadine, 2012).

The relative abundance (RA)

Among the 1552 individuals of scorpions sampled in Ouargla province, *A. australis* is the most abundant species (47.36%). In the second position *S. punicus* with a rate of 19.07%. The two species *B. arenicola* and *A. amoreuxi* have close ratios 15.01% and 12.69%, respectively.

The species *O. innesi* is represented by a low percentage 4.90%. However, the other species *B. samiae*, *B. bicalcaratus*, *B. saharicus*, and *B. tunetanus* are represented by ratios lesser than 0.5%.

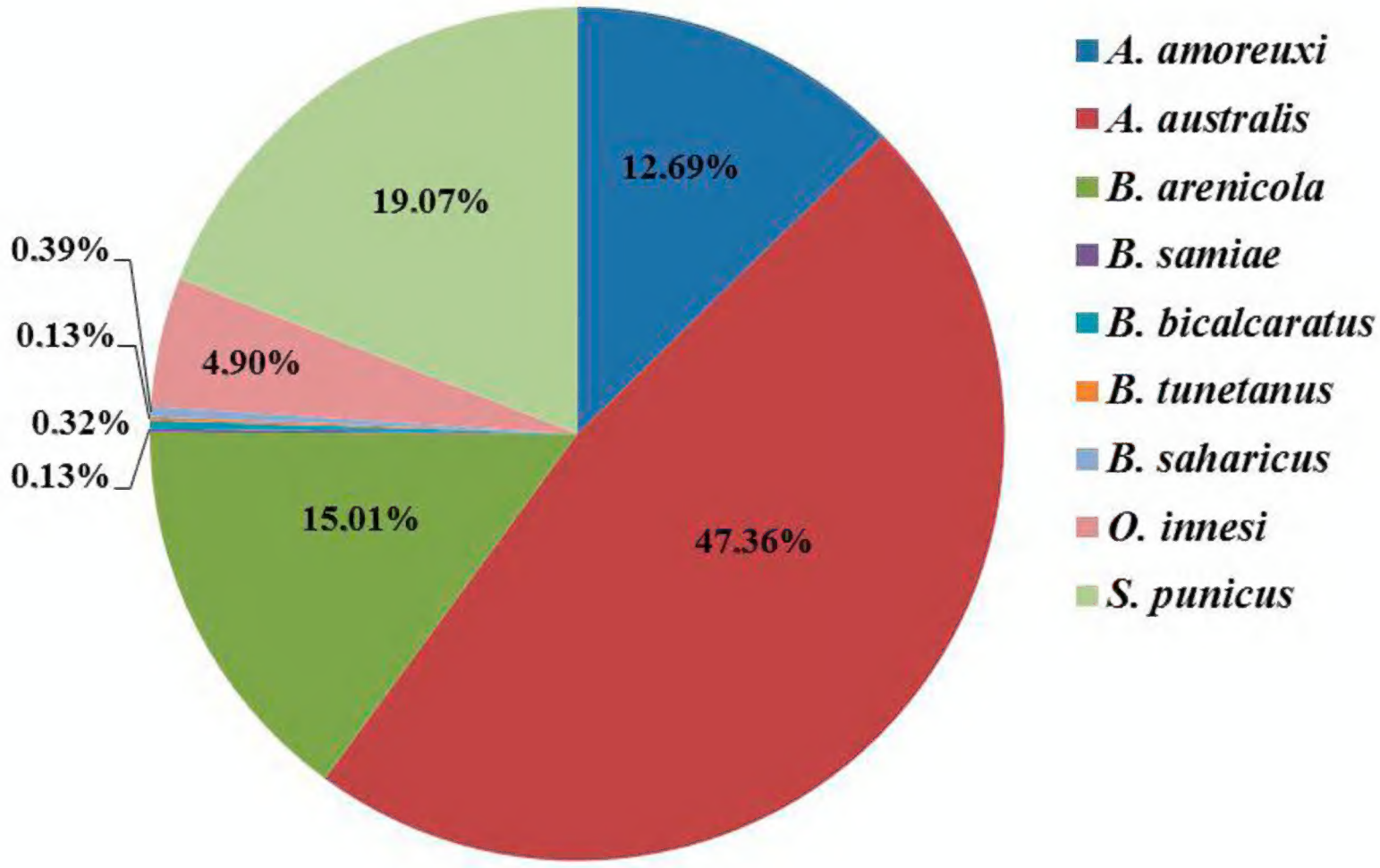

Fig. 4. Relative abundance of scorpion species recorded in Ouargla province (Algerian Septentrional Sahara) between 2005-2018.

Sadine & Idder (2009) reported that *A. australis* is very abundant in the region of Ouargla (51%) in the same region. Sadine (2012; 2018b) estimated this species with more than 67% and 70%, respectively. In the region of El-Oued, this species represented 45.63% in 2011 (Sadine *et al.*, 2011), more than 65% in 2012 (Sadine, 2012), and 80% in 2018 (Sadine, 2018b). This species is classified as the most abundant species in Ghardaïa province with percentage 60% (Lahrech & Souilem, 2017). However, Sadine (2018b) estimated this species with 41.84% in this region. In Khenchela, it presented an abundance of 35.5% (Hasnaoui *et al.*, 2018). The same was observed in the region of M'Sila; Chichi (2015) confirmed the presence of *A. australis* in large quantities (31.5 %).

The species *S. punicus* regroups all species belonging to genus *Scorpio* in the highlands of Tunisia and northern Algeria (Lourenço & Rossi, 2016). Abdel-Nabi *et al.* (2004) indicated that *S. maurus* or its subspecies are known to be able to live at high altitude. However, Sadine *et al.* (2012) reported that this species is negatively associated with elevation, upper-tree vegetation, and vegetation cover, with an abundance of 15.15%

in National Park of Belezma (Batna). This species is represented with percentage of 7.48% and 13.47 respectively in Ouargla and El-Oued (Sadine, 2012). The same author stated that this species as rare in those two localities (Sadine, 2018b). In contrast, it is very abundant (47.9%) in M'Sila as reported by Chichi (2015). In this study, we observed that the abundance of this species is ranked in the second position (19.07%).

The species *B. arenicola* is generally caught in sandy environments in Ouargla region (Sadine, 2005, 2012). Vachon (1952) reported its presence in Touggourt (north of Ouargla) and El-Goléa (south of Ghardaïa). After the important revision of scorpion species belonging to genus *Buthacus* form North Africa, Lourenço (2006) proposed the name of *Buthacus* of the Northeastern of Algeria as *B. arenicola*. That's why, this species was reported as rare in Ouargla and El-Oued with less than 7% (Sadine, 2012) and very rare with less than 3% (Sadine, 2018b).

In our study, *A. amoreuxi* is the biggest species that generally found on sandy, gravelly and stony grounds (Sadine, 2005; 2012; Sadine *et al.*, 2014). This species with 12.69% is classified as accidental. The same results were reported by Sadine (2012) with less than 6% in Ouargla and El-Oued and 14.61% in Ouargla (Sadine, 2018b). However, Lahrech & Souilem (2017) and Sadine (2018b) reported that this species was very abundant in Ghardaïa (more than 40%).

The species *O. innesi* is classified as oasis scorpion (Vachon, 1952), with its small size it prefers shady and humid area (Sadine, 2005). Generally, this species was found in abundance in the palm groves (Sadine, 2005, 2012). In the Algerian Septentrional Sahara, this species is represented with abundance less than 5% (Sadine, 2012; Sadine & Bissati, 2014; Sadine, 2018b), the same was observed in the current studies (4.9%).

The other species *B. bicalcaratus*, *B. samiae*, *B. saharicus* and *B. tunetanus* were represented with very low abundance (less than 0.5%). Sadine *et al.* (2011) and Sadine (2012; 2018b) indicated that *B. bicalcaratus* remains very limited in the region of Est-Algerien with low abundance. Although, it was reported as a desert species (Vachon, 1952), it is described for the first time in the region of Ouargla. However, according to the distribution of this species proposed by Lourenço (2002), it can be highly possible found in this region. However, the same small abundance of the two species *B. samiae* and *B. saharicus* was recorded in the Ghardaïa region (Lahrech & Souilem, 2017; Sadine, 2018b). Moreover, *B. tunetanus* (0.13%) is considered the most rare species in Ouargla region, as the same reported in several works in Northern Saharan (Sadine, 2005; Sadine *et al.*, 2011; Sadine, 2012; 2018b). According to the distribution of this species proposed by Sadine *et al.* (2016), *B. tunetanus* cannot be found in Ouargla region. Sadine *et al.* (2012) indicated that *B. occitanus tunetanus* was positively associated with elevation, upper-tree vegetation, vegetation cover with an abundance of 67.0% in National Park of Belezma (Batna).

Diversity and scorpion structure

Depending on the study of the specific composition of the different study stations to examine the structure of these populations, both Shannon's index (H') and evenness (E) for this period 2005-2018 (14 years) have been determined. The results for these indices are summarized in Table (2).

Table 2. Shannon's index (H') and evenness (E) of scorpion fauna of Ouargla region between 2005-2018.

N	S (species)	H' (Bits)	E
1552	9	2.05	0.65

The value of Shannon's index (H') of the Ouargla region between 2005-2018 is estimated with 2.05 bits, indicating that this region can be classified as diversified area. Nevertheless, the value of evenness (E) equal 0.65 reflecting the low equilibrium between the effectiveness of sampled species. On the contrary, the values of this index calculated in Ouargla region do not exceed 1.58 bits which indicates poor diversity (Sadine, 2012). In the region of El-Oued, the erg and the palm grove were the most diversified (Sadine *et al.*, 2011; Sadine, 2012). In addition, a comparative study between four palm groves of Biskra, El-Oued, Ouargla, and Ghardaïa showed that the palm grove of El-Oued is the most diversified (Sadine & Bissati, 2014).

Concerning the values of evenness in the Algerian northern Sahara, they were varied between 0.70 and 0.97, indicating a balance between the numbers of sampled scorpion populations (Sadine, 2012). The same results (E = 0.68) were reported in Ghardaïa region showing an equilibrium between the effectiveness of five species identified (Lahrech & Souilem, 2017).

Conclusion

This work is the first one to highlight the composition of scorpion community in the region of Ouargla (Algerian northern Sahara) through a massive survey during fourteen years (from 2005 to 2018). A total of 1552 live scorpions were sampled and identified as nine species. The values of the relative abundance (RA), show that *A. australis* is the most abundant species. This species is reported as opportunistic species (Sadine, 2012) ranked as the most dangerous on a global scale (Goyffon & Billiald, 2007) and the responsible for mortality (Chippaux & Goyffon, 2008). Some other species are placed as accidental in Ouargla region such as: *S. punicus*, *B. arenicola*, and *A. amoreuxi* and have values less than 20%. *B. bicalcaratus* is reported as deserted species (Vachon, 1952) and is reported for the first time in Ouargla. Also, in this work, new records of *B. samiae* and *B. saharicus* are reported in our study area. The species *B. tunetanus* is considered as mountain scorpions (Sadine *et al.*, 2012), or as steppes species (Sadine *et al.*, 2016); its presence in the Algerian Sahara is very rare.

Based on the values of Shannon's index and evenness, scorpion diversification is well observed in Ouargla region (9 species). Nevertheless, there is a poor balance among the numbers of sampled species, with dominance of the thermophilic species as *A. australis*, *A. amoreuxi*, and *B. arenicola* because they are most adapted scorpions in this arid climate. However, the hygrophilic species such as *O. innesi* and *S. punicus* are localized in very limited humid area like palm groves.

The knowledge of the scorpion fauna obtained in Ouargla region showed a very important diversity with more than 23.5% of scorpion species reported in Algeria (Sadine, 2018a). Further investigations are needed to get a better idea about the scorpion fauna, including the possibility of existence of other species not yet described, and to study the biogeography of these species. Schwerdt *et al.* (2016) announced that scorpions are one of the most important taxa for ecological, conservation, and biogeographic studies.

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The first record of family Agelenidae from Iraq (Arachnida: Araneae)

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Abstract

Family Agelenidae and the spider species *Benoitia lepida* (O. Pickard-Cambridge, 1876) are both recorded in Iraq for the first time.

Keywords: Araneae, Agelenidae, *Benoitia lepida*, new record, Iraq.

Introduction

Iraq is one of the countries that lack focused information about its fauna of spiders. Presently, there is a few studies focused on providing information about spider fauna of Iraq. The first detailed study was presented by Najim (2015) who recorded 36 species of 30 genera and 13 families distributed in different regions of the Basrah province. After that, the first detailed list was presented by Zamani & El-Hennawy (2016) including 32 species of 29 genera and 16 families of spider, distributed in eight provinces: Erbil, Ninawa, Diyala, Baghdad, Salaheddin, Najaf, Karbala, and Basrah. However, there are still many regions of the country not yet studied.

Agelenidae is one of the largest families in the suborder Araneomorphae, described by Carl Ludwig Koch in 1837. It currently comprises 80 genera and 1288 species. Genus *Benoitia* Lehtinen, 1967 includes nine species (World Spider Catalog, 2018). According to previous studies, there are 23 families of spiders have been recorded in Iraq, but no member of the family Agelenidae has been recorded until now, as there are not any previous information about the spiders in Dhi Qar province. In the present paper, *Benoitia lepida* (O. Pickard-Cambridge, 1876) and family Agelenidae are recorded as new records to the spider fauna of Iraq.

Fig. 1. Map of collecting locality of *Benoitia lepida* in Al-Naser district, Dhi Qar province, Southern Iraq.

The examined samples were collected from under tree of *Tamarix* sp. by hand during the daytime, from Al-Naser district in Dhi Qar province, Southern Iraq (Fig. 1). They were preserved in 70% ethanol, examined using NBT-3A stereomicroscope, and identified according to Blauwe (1980), Levy (1996), and Zamani *et al.* (2016). The measurements of the legs are given as total length (femur, patella+tibia, metatarsus, tarsus). All measurements are in millimetres.

Taxonomy

Family Agelenidae C.L. Koch, 1837
Genus *Benoitia* Lehtinen, 1967

Agelena lepida O. Pickard-Cambridge, 1876: 558 (♂♀).
Agelena lepida de Blauwe, 1980: 19, f. 30-35 (♂♀).
Benoitia lepida Levy, 1996: 95, figs. 36-39 (♂♀).
Benoitia lepida Zamani *et al.*, 2016: 103, f. 4-6 (♂♀).

Benoitia lepida (O. Pickard-Cambridge, 1876) (Figs. 2-3)
Material examined. 1♂ 1♀, Iraq: Dhi Qar Province, Al-Naser district, 31°32'4.50"N, 46°7'14.66"E, 16.12.2017.
Description. Male, measurements: Total body length 3.9. Carapace length 1.8, width 1.3. Abdomen length 2.1, width 1.1. Carapace with deep pear-shaped fovea, marked with somewhat irregular blackish-brown radiating or branched lines, giving the surface of the carapace reticulate appearance. Chelicerae yellowish, fangs reddish-brown, with three promarginal and two retromarginal teeth. Palp medium-sized and yellow. Eight eyes grouped in two rows strongly procurved and nearly in parallel lines. Anterior median eyes bigger. Posterior median eyes smaller than others. Anterior and posterior lateral eyes equal. Sternum with strong irregularly edged blackish margin. Labium rectangular, gray-brown, endites yellowish. Legs yellow, with blackish-brown irregular spots on femora and many long prominent spines, and furnished with hairs; each tarsus ends with three

slightly curved claws. Abdomen pale yellow, nearly oval-shaped, with a broad longitudinal whitish band on its upper side, and the front part has a little of rusty red colouration. The whitish band bordered by the prominent points being distinctly whiter and brighter than the rest; the lower side of the abdomen with some irregular black spots, the central longitudinal band is more visible than others, there are also some black spots on the sides; spinnerets yellow. Leg measurements: I 3.6 (1.1, 1.2, 0.9, 0.4), II 3.9 (1.2, 0.9, 1.1, 0.7), III 4.6 (1.2, 1.4, 1.2, 0.8), IV 5.7 (1.8, 1.4, 1.6, 0.9). Palp: As in Fig. (2C-E).

Fig. 2. *Benoitia lepida* (O. Pickard-Cambridge, 1876) ♂. A-B. Habitus A. dorsal view. B. ventral view. C-E. left palp. C. prolateral view. D. ventral view. E. retrolateral view.

Fig. 3. *Benoitia lepida* (O. Pickard-Cambridge, 1876) ♀. A-B. Habitus A. dorsal view. B. ventral view. C. Epigynum, ventral view. D. Spinnerets.

Female, measurements: Total body length 7.7, carapace length 2.9, width 2.1. Abdomen length 4.8, width 3.2. Other characters as in the male, but the markings are lesser in sharpness and clarity. Legs have tibiae and femora with blackish spots. Epigynum with two oval openings close to each other (Fig. 3C). Leg measurements: I 3.9 (1.2, 1.3, 0.8, 0.6), II 4.3 (1.1, 1.2, 1.2, 0.8), III 4.9 (1.3, 1.4, 1.3, 0.9), IV 5.8 (1.4, 1.5, 1.8, 1.1).

Habitat: The specimens were collected from under *Tamarix* sp. tree in a steppe habitat at southern Iraq (Fig. 4).
Global distribution: This species has been recorded from Spain, North Africa, Cyprus, Israel, Iran, Yemen (World Spider Catalog, 2018), Turkey, Kuwait, Saudi Arabia, (Bolzern, 2015), and Iraq (present paper).

Fig. 4. Habitat and sheet web of *Benoitia lepida*. A. Habitat, steppe region, Al-Naser district, Dhi Qar, Iraq. B-D. Sheet web under *Tamarix* sp. tree. E. *Benoitia lepida* in its natural habitat.

Comments: As Levy (1996) pointed out, members of the genus *Benoitia* are "easily distinguished from other agelenids by the palpal structure of the males with their turbinate conductor and the apical membranous lamella and by the paired openings of the females' epigyna". He noted that this species is living in stony deserts. Iraqi specimens

were found under *Tamarix* sp. trees. Knutson *et al.* (2010) has also reported finding of some agelenid spiders under *Tamarix* sp. trees.

According to Najim (2015), Zamani & El-Hennawy (2016) and the current paper, so far record, 62 spider species belonging to 51 genera in 23 families have been recorded in Iraq. But when comparing the Iraqi spider fauna with some neighbouring countries, there is 562 spider species have been recorded from Iran (Zamani *et al.*, 2016), and 1022 species from Turkey (World Spider Catalog, 2018), it becomes apparent that the Iraqi fauna is still incompletely inventoried. Therefore, due to Iraq's geographical location and climate, it is expected that there is a great diversity of Iraqi spiders still needs many studies.

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Palpimanus orientalis Kulczyński, 1909 (Araneae: Palpimanidae) is a new record for Turkish spider fauna

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Abstract

The palpimanid spider species, *Palpimanus orientalis* Kulczyński, 1909 is recorded for the first time from Anatolia. General habitus and genitalia of both male and female are illustrated, and collecting data of this species are also given.

Keywords: Spiders, Palpimanidae, new record, Turkey.

Introduction

The family Palpimanidae is a small family that contains 150 species from 18 genera and genus *Palpimanus* has 36 species being listed in the latest version of the World Spider Catalog (2018). There are only 3 species, *Palpimanus gibbulus* Dufour, 1820, *Palpimanus sogdianus* Charitonov, 1946 and *Palpimanus uncatus* Kulczyński, 1909 known from Turkey (Demir & Seyyar, 2017). The aim of this study is to report another *Palpimanus* species from the Turkish spider fauna.

Material and Methods

In this study, four male and three female specimens were collected from Kütahya and Uşak Provinces in Anatolia (Fig. 1). Examined specimens were preserved in 70% ethanol and deposited in the NOHUAM (Niğde Ömer Halisdemir University Arachnological Museum). For identification, the papers of Kulczyński (1909), Platnick (1981), and Le Peru (2011) were consulted. The identification was made by means of a SZX61 Olympus stereomicroscope.

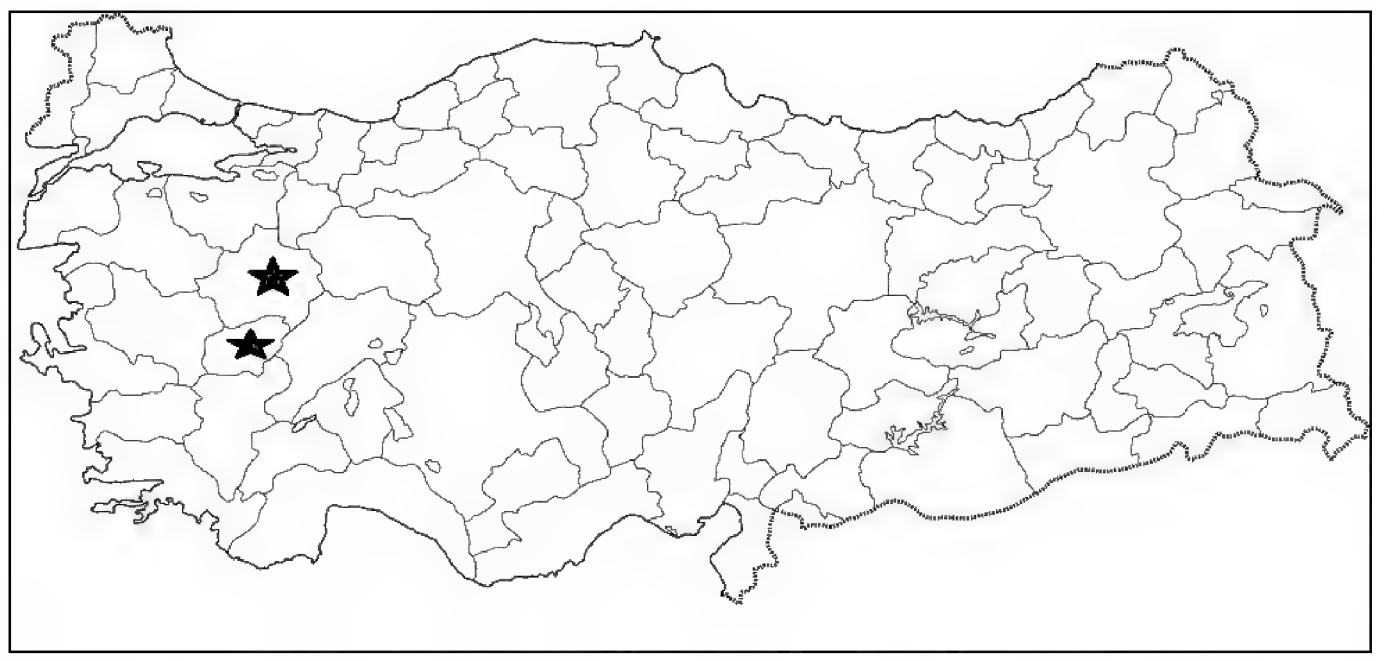

Fig 1. Collecting localities from Kütahya and Uşak Provinces, Turkey.

Results

Palpimanus orientalis Kulczyński, 1909 (Figs. 2-3)

Collected specimens: Uşak Province: Sivaslı district, Yayalar village (38°28'15"N, 29°36'20"E), 847m, 28.VIII.2015, 1♂; Karahallı district, Delihıdırlı village (38°19'41"N, 29°33'42"E), 850m, 07.IX.2016, 1♂; 23.X.2016, 1♀; **Kütahya Province:** Dumlupınar district, Ağaç village (38°54'16"N, 29°58'21"E), 1217m, 30.VI.2015, 1♂; 19.XI.2016, 1♀. On road of Dumlupınar-Altıntaş districts (38°56'43"N, 30°05'20"E), 1087m, 31.VIII.2015, 1♂; 19.XI.2016, 1♀.

Identification references and description: Kulczyński (1909), Platnick (1981), and Le Peru (2011).

World distribution. Albania, Greece (World Spider Catalog, 2018) and Turkey (this study).

Fig. 2. *Palpimanus orientalis* Kulczyński, 1909. A-B. Habitus. A. Female. B. Male.

Fig. 3. *Palpimanus orientalis* Kulczyński, 1909. A. Male palp, lateral view. B. Female epigyne, ventral view.

Identification key to the Turkish species of genus *Palpimanus* (males):

1. Prolateral prong broadened and almost straight ..... ***P. gibbulus***
2. Prolateral prong long and apically narrowed, its flange occupies about half the length of the sclerotised part of the prong ..... ***P. orientalis***
3. Prolateral prong long and apically narrowed, its length is nearly the same as other part of the palp ..... ***P. uncatus***
4. Apical part of bulbus is different and more complicated than other species ..... ***P. sogdianus***

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Arachnofauna of Eastern Mediterranean region of Turkey (Arthropoda: Chelicerata: Arachnida)

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Abstract

In this research, specimens of whip spiders (Amblypygi), false scorpions (Pseudoscorpiones), scorpions (Scorpiones), sun-spiders (Solifugae), spiders (Araneae), and harvestmen (Opiliones) were collected from 55 districts of 7 provinces in Eastern Mediterraneaen region of Turkey in 2009 and 2010. A total of 164 species of arachnids were recorded from the study area.

Keywords: Arachnida, Arachnofauna, Eastern Mediterranean region, Turkey.

Introduction

Arachnida is a large class of chelicerate arthropods including the orders Araneae (spiders), Scorpiones (scorpions), Opiliones (harvestmen), Pseudoscorpiones (false scorpions), Solifugae (camel spiders), the subclass Acari (mites and ticks), as well as lesser-known subgroups. Acari and spiders are the most common groups of all arachnids. Most of arachnids are predators except some harvestmen (which feed on dead organic matter), ticks (ectoparasites), and mites. Also, a few species of Acari, which transmit diseases to humans, animals, and plants have economic importance. Almost most arachnid groups spread in Turkey; a total of 1117 species and two subspecies of spiders (Demir & Seyyar, 2017), 33 species and 1 subspecies of solifugids (El-Hennawy, 2007), a species of amblypygi (Seyyar & Demir, 2007), 88 species of harvestmen (Kurt, 2014), 17 species and 22 subspecies of scorpions (Koç & Yağmur, 2007), and 98 species of pseudoscorpions (Kunt *et al.*, 2008) have been reported from Turkey.

In this study, 149 species belonging to 92 genera of 29 families of order Araneae, 1 species of order Amblypygi, 1 species of order Pseudoscorpiones, 6 species belonging

to 4 families of order Scorpiones, 4 species belonging to 1 genus of order Solifugae, and 3 species belonging to 3 genera in a family of order opiliones were determined. The aim of this study is to present the arachnid diversity of Eastern Mediterraneaen region of Turkey.

Material and Methods

Specimens of class Arachnida were collected from 55 districts of 7 provinces in Eastern Mediterraneaen region of Turkey between April 2009 and June 2010 (Fig. 1) using different methods. The specimens were preserved in 70% ethanol. The identification was made by means of a SZX61 Olympus stereomicroscope. Examined specimens were deposited in the ZMGU (Zoology Museum of Gazi University).

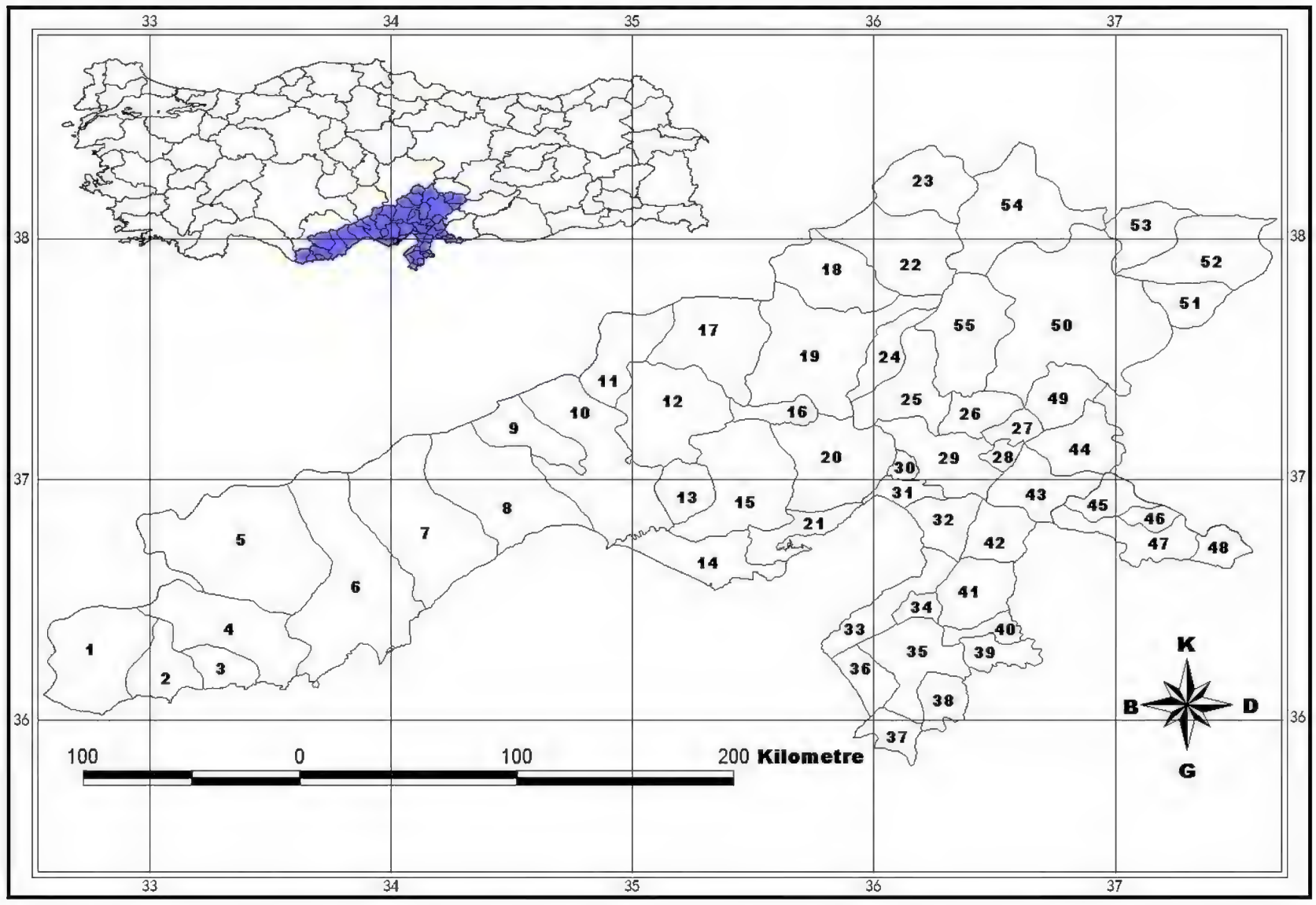

Fig. 1. Map of the study area. **Mersin province:** 1. Anamur, 2. Bozyazı, 3. Aydıncık, 4. Gülnar, 5. Mut, 6. Silifke, 7. Erdemli, 8. İçel, 9. Çamlıyayla, 10. Tarsus; **Adana province:** 11. Pozantı, 12. Karaisalı, 13. Seyhan, 14. Karataş, 15. Yüreğir, 16. İmamoğlu, 17. Aladağ, 18. Feke, 19. Kozan, 20. Ceyhan, 21. Yumurtalık, 22. Saimbeyli, 23. Tufanbeyli; **Osmaniye province:** 24. Sumbaş, 25. Kadirli, 26. Düziçi, 27. Bahçe, 28. Hasanbeyli, 29. Osmaniye, 30. Toprakkale; **Hatay province:** 31. Erzin, 32. Dörtyol, 33. İskenderun, 34. Belen, 35. Hatay, 36. Samandağı, 37. Yayaladağ, 38. Altınözü, 39. Reyhanlı, 40. Kumlu, 41. Kırıkhan, 42. Hassa; **Gaziantep province:** 43. İslahiye, 44. Nurdağı; **Kilis province:** 45. Musabeyli, 46. Polateli, 47. Kilis, 48. Elbeyli; **Kahramanmaraş province:** 49. Türkoğlu, 50. Centrum, 51. Pazarcık, 52. Çağlayan Cerit, 53. Nurhak, 54. Göksun, 55. Andırın.

Results

A total of 164 species of arachnids were collected from Eastern Mediterraneaen region of Turkey (Table 1).

Table 1. List of arachnids collected from Eastern Mediterraneaen region of Turkey.

Order AMBLYPYGI

Charinidae
Charinus ioanniticus (Kritscher, 1959)

Order ARANEAE

Agelenidae
Agelena labyrinthica (Clerck, 1757)
Allagelena gracilens C.L. Koch, 1841

Anyphaenidae
Anyphaena accentuata (Walckenaer, 1802)

Araneidae
Aculepeira ceropegia (Walckenaer, 1802)
Agalenatea redii (Scopoli, 1763)
Araneus diadematus Clerck, 1757
Araniella displicata (Hentz, 1847)
Araniella opisthographa (Kulczyński, 1905)
Argiope bruennichi (Scopoli, 1772)
Argiope lobata (Pallas, 1772)
Cyclosa conica (Pallas, 1772)
Gibbaranea gibbosa (Walckenaer, 1802)
Hypsosinga albovittata (Westring, 1851)
Mangora acalypha (Walckenaer, 1802)
Neoscona adianta (Walckenaer, 1802)
Singa nitidula C.L. Koch, 1844
Zilla diodia (Walckenaer, 1802)

Dictynidae
Dictyna arundinacea (Linneaus, 1758)

Dysderidae
Dysdera crocata C.L. Koch, 1838

Eresidae
Eresus kollari Rossi, 1846

Eutichuridae
Cheiracanthium pelasgicum (C.L. Koch, 1837)
Cheiracanthium pennyi O. Pickard-Cambridge, 1873

Gnaphosidae
Berinda hakani Chatzaki & Seyyar, 2010
Callilepis cretica (Roewer, 1928)
Callilepis nocturna (Linnaeus, 1758)
Civizelotes caucasius (L. Koch, 1866)
Drassodes lacertosus (O. Pickard-Cambridge, 1872)
Drassodes lapidosus (Walckenaer, 1802)
Drassyllus crimeaensis Kovblyuk, 2003
Drassyllus praeficus (L. Koch, 1866)
Gnaphosa dolosa Herman, 1879
Gnaphosa montana (L. Koch, 1866)
Haplodrassus dalmatensis (L. Koch, 1866)
Haplodrassus invalidus (O. Pickard-Cambridge, 1872)
Haplodrassus signifer (C.L. Koch, 1839)
Haplodrassus umbratilis (L. Koch, 1866)
Micaria albovittata (Lucas, 1846)
Micaria coarctata (Lucas, 1846)
Nomisia conigera (Spassky, 1941)
Nomisia exornata (C.L. Koch, 1839)
Nomisia orientalis Dalmas, 1921
Nomisia ripariensis (O. Pickard-Cambridge, 1872)
Pterotricha lentiginosa (C.L. Koch, 1837)
Setaphis carmeli (O. Pickard-Cambridge, 1872)
Zelotes cingarus (O. Pickard-Cambridge, 1874)
Zelotes harmeron Levy, 2009
Zelotes longipes (L. Koch, 1866)
Zelotes puritanus Chamberlin, 1922
Zelotes segrex (Simon, 1878)
Zelotes subterraneus (C.L. Koch, 1833)
Zelotes tenuis (L. Koch, 1866)
Zelotes turcicus Seyyar, Demir & Aktaş, 2010

Linyphiidae
Frontinellina frutetorum (C.L. Koch, 1834)
Tenuiphantes zimmermanni (Bertkau, 1890)

Liocranidae
Sagana rutilans Thorell, 1875

Lycosidae
Alopecosa barbipes (Sundevall, 1833)
Alopecosa cuneata (Clerck, 1757)
Alopecosa fabrilis (Clerck, 1757)
Alopecosa pulverulenta (Clerck, 1757)
Arctosa cinerea (Fabricius, 1777)
Arctosa perita (Latreille, 1799)
Aulonia kratochvili Dunin, Buchar & Absolon, 1986
Geolycosa vultuosa (C.L. Koch, 1838)
Hogna radiata (Latreille, 1817)
Lycosa singoriensis (Laxmann, 1770)
Pardosa agrestis (Westring, 1861)
Pardosa hortensis (Thorell, 1872)
Pardosa lugubris (Walckenaer, 1802)
Pardosa proxima (C.L. Koch, 1847)
Pardosa pullata (Clerck, 1757)
Trochosa ruricola (De Geer, 1778)

Miturgidae
Zora spinimana (Sundevall, 1833)

Oecobiidae
Oecobius teliger O. Pickard-Cambridge, 1872
Uroctea durandi (Latreille, 1809)

Oxyopidae
Peucetia virescens (O. Pickard-Cambridge, 1872)
Oxyopes heterophthalmus (Latreille, 1804)
Oxyopes lineatus Latreille, 1806
Oxyopes ramosus (Martini & Goeze, 1778)

Table 1. (coninued)

Palpimanidae
Palpimanus gibbulus Dufour, 1820

Philodromidae
Pulchellodromus pulchellus (Lucas, 1846)
Thanatus atratus Simon, 1875
Thanatus fabricii (Audouin, 1825)
Thanatus formicinus (Clerck, 1757)
Thanatus imbecillus L. Koch, 1878
Thanatus oblongiusculus (Lucas, 1846)
Thanatus pictus L. Koch, 1881
Thanatus vulgaris Simon, 1870
Tibellus oblongus (Walckenear, 1802)

Pholcidae
Pholcus opilionoides (Schrank, 1781)
Pholcus phalangioides (Fuesslin, 1775)
Spermophora senoculata (Dugès, 1836)

Pisauridae
Pisaura mirabilis (Clerck, 1757)

Salticidae
Cyrba algerina (Lucas, 1846)
Euophrys frontalis (Walckenaer, 1802)
Euophrys herbigrada (Simon, 1871)
Evarcha falcata (Clerck, 1757)
Habrocestum latifasciatum (Simon, 1868)
Heliophanus dubius C.L. Koch, 1835
Mendoza canestrinii (Ninni, 1868)
Mogrus neglectus (Simon, 1868)
Philaeus chrysops (Poda, 1761)
Phlegra bresnieri (Lucas, 1846)
Phlegra fasciata (Hahn, 1826)
Plexippus paykulli (Audouin, 1825)
Pseudeuophrys lanigera (Simon, 1871)

Scytodidae
Scytodes thoracica (Latreille, 1802)

Sicariidae
Loxosceles rufescens (Dufour, 1820)

Sparassidae
Heteropoda venatoria (Linnaeus, 1767)
Micrommata virescens (Clerck, 1757)

Tetragnathidae
Metellina segmentata (Clerck, 1757)

Theraphosidae
Chaetopelma olivaceum (C.L. Koch, 1841)

Theridiidae
Anelosimus vittatus (C.L. Koch, 1836)
Asagena phalerata (Panzer, 1801)
Cryptachaea riparia (Blackwall, 1834)
Enoplognatha mordax (Thorell, 1875)
Enoplognatha oelandica (Thorell, 1875)
Enoplognatha ovata (Clerck, 1757)
Enoplognatha thoracica (Hahn, 1833)
Episinus truncatus Latreille, 1809
Latrodectus tredecimguttatus (Rossi, 1790)
Phylloneta sisyphia (Clerck, 1757)
Steatoda albomaculata (De Geer, 1778)
Steatoda castanea (Clerck, 1757)
Steatoda paykulliana (Walckenaer, 1806)
Theridion melanurum Hahn, 1831

Thomisidae
Misumena vatia (Clerck, 1757)
Monaeses israeliensis Levy, 1973
Ozyptila tricoloripes Strand, 1913
Runcinia grammica (C.L. Koch, 1837)
Synema anatolica Demir, Aktaş &Topçu, 2009
Synema globosum (Fabricius, 1775)
Thomisus onustus Walckenaer, 1805
Tmarus piochardi (Simon, 1866)
Xysticus caperatus Simon, 1875
Xysticus cor Canestrini, 1873
Xysticus edax (O. Pickard-Cambridge, 1872)
Xysticus kaznakovi Utochkin, 1968
Xysticus kochi Thorell, 1872
Xysticus laetus Thorell, 1875
Xysticus ninnii Thorell, 1872
Xysticus pseudorectilineus (Wunderlich, 1995)
Xysticus striatipes L. Koch, 1870
Xysticus thessalicus Simon, 1916
Xysticus tristrami (O. Pickard-Cambridge, 1872)

Titanoecidae
Nurscia albomaculata (Lucas, 1846)

Uloboridae
Uloborus walckenaerius Latreille, 1806

Zodariidae
Pax islamita (Simon, 1873)
Zodarion morosum Denis, 1935
Zodarion thoni Nosek, 1905

Order OPILIONES

Phalangiidae
Opilio parietinus (De Geer, 1778)
Phalangium savignyi Audouin, 1825
Zachaeus anatolicus (Kulczyński, 1903)

Order PSEUDOSCORPIONES

Neobisiidae
Acanthocreagris ressli (Beier, 1965)

Table 1. (coninued)

Order SCORPIONES	**Scorpionidae**
Buthidae	*Scorpio maurus* Linnaeus, 1758
Mesobuthus eupeus (C.L. Koch, 1839)	
Mesobuthus gibbosus (Brullé, 1832)	**Order SOLIFUGAE**
Mesobuthus nigrocinctus (Ehrenberg, 1828)	**Galeodidae**
	Galeodes araneoides (Pallas, 1772)
Euscorpiidae	*Galeodes graecus* C.L. Koch, 1842
Euscorpius carpathicus (Linnaeus, 1767)	*Galeodes marginatus* Roewer, 1961
	Galeodes viridipilosus Roewer, 1941
Iuridae	
Iurus dufoureius (Brullé, 1832)	

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An overview of Turkish gnaphosid fauna (Araneae: Gnaphosidae)

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Abstract

Turkey has a rich biodiversity due to its zoogeographical position. This situation makes it rich in fauna of the spiders as other living groups. Since many studies have been carried out in Turkey to detect ground spiders (Gnaphosidae) by this time, it has been necessary to compile these studies to determine the total gnaphosid fauna. According to available publications, Gnaphosidae is the most dominant spider family in Turkey and it contains 150 taxa in total.

Keywords: Spiders, Gnaphosidae, fauna, Turkey.

Introduction

Spiders are one of the most important groups of arthropods known as arachnids, which can live in many different habitats and are important for the preservation of natural balance because they feed on insects. In our country, 1117 species have been identified so far (Demir & Seyyar, 2017). Spiders have 118 families, and one of them is family Gnaphosidae that is represented by 2226 species in the world (World Spider Catalog, 2018) and 150 taxa of them are found in Turkey (Demir & Seyyar, 2017). The aim of this study is to review all the literature of family Gnaphosidae in the country and to reveal the state of the ground spider fauna.

Methods

In this study, all the literature about family Gnaphosidae in Turkey were compiled. Theses and scientific meetings are not formal publications and are consequently not considered herein.

Results

As a result of literature review, a total of 149 ground spider species and 1 subspecies belonging to 29 genera were recorded in Turkey. All taxa and their references are listed in Table (1).

Table 1. List of ground spider species in Turkey.

Gnaphosidae	**References**	**Records in Turkey**
Anagraphis ochracea (L. Koch, 1867)	Demircan & Topçu (2015)	MR
Anagraphis pallens Simon, 1893	Topçu *et al.* (2005)	MER, CAR
Aphantaulax cincta (L. Koch, 1866)	Öztürk *et al.* (2013)	MER
Aphantaulax trifasciata (O. Pickard-Cambridge, 1872)	Topçu *et al.* (2005)	CAR, AR
Aphantaulax trifasciata trimaculata Simon, 1878	Topçu *et al.* (2005)	CAR
Berinda amabilis Roewer, 1928	Panayiotou *et al.* 2010	CAR
Berinda cooki Logunov, 2012 *	Logunov (2012)	MER
Berinda ensigera (O. Pickard-Cambridge, 1874)	Topçu *et al.* (2005), Kovblyuk *et al.* 2009	AR, MER, CAR
Berinda hakani Chatzaki & Seyyar, 2010 *	Panayiotou *et al.* 2010	CAR
Berlandina plumalis (O. Pickard-Cambridge, 1872)	Topçu *et al.* (2005)	CAR
Berlandina pulchra (Nosek, 1905) *	Topçu *et al.* (2005)	CAR
Callilepis cretica (Roewer, 1928)	Seyyar *et al.* (2006)	CAR
Callilepis nocturna (Linnaeus, 1758)	Seyyar *et al.* (2009a)	CAR
Cesonia aspida Chatzaki, 2002	Seyyar *et al.* (2007)	MER
Civizelotes caucasius (L. Koch, 1866)	Topçu *et al.* (2005)	CAR, EAR, SAR
Civizelotes gracilis (Canestrini, 1868)	Topçu *et al.* (2005)	EAR
Civizelotes solstitialis (Levy, 1998)	Seyyar *et al.* (2006)	CAR
Cryptodrassus creticus Chatzaki, 2002	Seyyar *et al.* (2006)	MER
Drassodes bifidus Kovblyuk & Seyyar, 2009 *	Kovblyuk *et al.* (2009), Seyyar *et al.* (2015)	MER, CAR
Drassodes caspius Ponomarev & Tsvetkov, 2006	Çoşar *et al.* (2017)	AR, CAR
Drassodes cupreus (Blackwall, 1834)	Akpınar *et al.* (2011)	MER
Drassodes difficilis (Simon, 1878)	Topçu *et al.* (2005)	CAR
Drassodes lacertosus (O. Pickard-Cambridge, 1872)	Seyyar *et al.* (2009a)	
Drassodes lapidosus (Walckenaer, 1802)	Topçu *et al.* (2005)	MR, MER, CAR, EAR, SAR
Drassodes lutescens (C.L. Koch, 1839)	Topçu *et al.* (2005)	MER, CAR, EAR, SAR
Drassodes pubescens (Thorell, 1856)	Topçu *et al.* (2005)	MER, CAR, EAR, SAR
Drassodes serratichelis (Roewer, 1928)	Seyyar *et al.* (2009a)	MER
Drassodes similis Nosek, 1905 *	Topçu *et al.* (2005)	CAR
Drassodes villosus (Thorell, 1856)	Topçu *et al.* (2005)	CAR, EAR
Drassodex hypocrita (Simon, 1878)	Akpınar *et al.* (2011)	MER
Drassyllus crimeaensis Kovblyuk, 2003	Kovblyuk *et al.* (2009)	MER
Drassyllus dadia Komnenov & Chatzaki, 2016	Çoşar *et al.* (2018)	CAR
Drassyllus jubatopalpis Levy, 1998	Kovblyuk *et al.* (2009)	MER
Drassyllus lutetianus (L. Koch, 1866)	Topçu *et al.* (2005)	EAR, SAR

Drassyllus praeficus (L. Koch, 1866)	Topçu *et al.* (2005)	CAR, EAR, SAR
Drassyllus pumilus (C.L. Koch, 1839)	Topçu *et al.* (2005)	CAR, EAR
Drassyllus pusillus (C.L. Koch, 1833)	Topçu *et al.* (2005)	CAR, AR
Drassyllus sur Tuneva & Esyunin, 2003	Kovblyuk *et al.* (2009)	MER
Drassyllus villicus (Thorell, 1875)	Topçu *et al.* (2005)	EAR
Drassyllus vinealis (Kulczyński, 1897)	Topçu *et al.* (2005)	CAR
Echemus angustifrons (Westring, 1861)	Akpınar *et al.* (2011)	MER
Echemus levyi Kovblyuk & Seyyar, 2009 *	Kovblyuk *et al.* (2009)	MER
Gnaphosa bicolor (Hahn, 1833)	Topçu *et al.* (2005)	EAR, SAR
Gnaphosa bithynica Kulczyński, 1903	Topçu *et al.* (2005)	MR, CAR
Gnaphosa corticola Simon, 1914	Topçu *et al.* (2005)	CAR
Gnaphosa dolosa Herman, 1879	Topçu *et al.* (2005)	MR
Gnaphosa lapponum (L. Koch, 1866)	Topçu *et al.* (2005)	EAR
Gnaphosa leporina (L. Koch, 1866)	Topçu *et al.* (2005)	EAR
Gnaphosa lucifuga (Walckenaer, 1802)	Topçu *et al.* (2005)	MR, CAR, EAR, SAR
Gnaphosa lucifuga minor Nosek, 1905 *	Topçu *et al.* (2005)	CAR
Gnaphosa lugubris (C.L. Koch, 1839)	Topçu *et al.* (2005)	EAR, SAR, AR
Gnaphosa microps Holm, 1939	Topçu *et al.* (2005)	MR
Gnaphosa modestior Kulczyński, 1897	Topçu *et al.* (2005)	EAR
Gnaphosa mongolica Simon, 1895	Seyyar *et al.* (2009a)	CAR
Gnaphosa montana (L. Koch, 1866)	Seyyar *et al.* (2006)	CAR
Gnaphosa muscorum (L. Koch, 1866)	Seyyar *et al.* (2009a)	CAR
Gnaphosa opaca Herman, 1879	Topçu *et al.* (2005)	CAR
Gnaphosa petrobia L.Koch, 1872	Topçu *et al.* (2005)	CAR, EAR
Gnaphosa steppica Ovtsharenko, Platnick & Song, 1992	Topçu *et al.* (2005)	CAR
Gnaphosa tigrina Simon, 1878	Topçu *et al.* (2005)	EAR
Haplodrasus dalmatensis (C.L. Koch, 1866)	Topçu *et al.* (2005)	CAR, EAR
Haplodrassus invalidus (O. Pickard-Cambridge, 1872)	Seyyar *et al.* (2009a)	MER, CAR
Haplodrassus kulczynskii Lohmander, 1942	Seyyar *et al.* (2009a)	MER
Haplodrassus macellinus (Thorell, 1871)	Topçu *et al.* (2005)	CAR
Haplodrassus mediterraneus Levy, 2004	Seyyar (2011)	MER
Haplodrassus minor (O. Pickard-Cambridge, 1879)	Çoşar *et al.* (2018)	CAR
Haplodrassus morosus (O. Pickard-Cambridge, 1872)	Seyyar *et al.* (2009a)	MER, CAR
Haplodrassus ovtchinnikovi Ponomarev, 2008	Kovblyuk *et al.* (2009)	MER
Haplodrassus ponomarevi Kovblyuk & Seyyar, 2009	Kovblyuk *et al.* (2009)	MER
Haplodrassus signifer (C.L. Koch, 1839)	Topçu *et al.* (2005)	MR, CAR, EAR, SAR, AR
Haplodrassus silvestris (Blackwall, 1833)	Seyyar (2011)	SAR
Haplodrassus soerenseni (Strand, 1900)	Seyyar *et al.* (2009a)	MER
Haplodrassus umbratilis (L. Koch, 1866)	Topçu *et al.* (2005)	CAR
Leptodrassus albidus Simon, 1914	Seyyar & Demir (2010)	AR, MBR
Micaria albovittata (Lucas, 1846)	Topçu *et al.* (2005)	CAR, EAR, SAR
Micaria bosmansi Kovblyuk & Nadolny, 2008	Demir *et al.* (2014)	CAR
Micaria coarctata (Lucas, 1846)	Topçu *et al.* (2005)	MR, EAR
Micaria dives (Lucas, 1846)	Topçu *et al.* (2005)	EAR
Micaria formicaria (Sundevall, 1831)	Topçu *et al.* (2007)	MER
Micaria pallipes (Lucas, 1846)	Efil *et al.* (2012)	SAR
Micaria pulicaria (Sundevall, 1831)	Topçu *et al.* (2005)	EAR, SAR
Micaria rossica Thorell, 1875	Topçu *et al.* (2005)	CAR, EAR, SAR
Micaria sociabilis (Kulczyński, 1897)	Seyyar *et al.* (2009a)	CAR, MER
Nomisia aussereri (L. Koch, 1872)	Topçu *et al.* (2005)	MR, AR, CAR
Nomisia conigera (Spassky, 1941)	Seyyar *et al.* (2009b)	CAR, MER
Nomisia excerpta (O. Pickard-Cambridge, 1872)	Seyyar & Demir (2010)	AR
Nomisia exornata (C.L. Koch, 1839)	Topçu *et al.* (2005)	AR, CAR
Nomisia negebensis Levy, 1995	Seyyar *et al.* (2009b)	CAR, MER
Nomisia orientalis Dalmas, 1921 *	Topçu *et al.* (2005), Seyyar *et al.* (2009b)	MER, AR

Nomisia palaestina (O. Pickard-Cambridge, 1872)	Seyyar *et al.* (2009a)	CAR
Nomisia ripariensis (O. Pickard-Cambridge, 1872)	Topçu *et al.* (2005)	MER, CAR
Parasyrisca turkenica Ovtsharenko, Platnick & Marusik, 1995 *	Ovtsharenko *et al.* (1995)	EAR
Parasyrisca vinosa (Simon, 1878)	Seyyar *et al.* (2009a)	SAR
Phaeocedus braccatus (L. Koch, 1866)	Seyyar *et al.* (2006)	CAR
Poecilochroa senilis (O. Pickard-Cambridge, 1872)	Seyyar *et al.* (2006)	CAR
Poecilochroa variana (C.L. Koch, 1839)	Topçu *et al.* (2005)	EAR
Pseudodrassus ricasolii Caporiacco, 1935 *	Topçu *et al.* (2005)	CAR
Pterotricha conspersa (O. Pickard-Cambridge, 1872)	Topçu *et al.* (2005)	MER
Pterotricha kochi (O. Pickard-Cambridge, 1872)	Topçu *et al.* (2005)	CAR
Pterotricha lentiginosa (C.L. Koch, 1837)	Topçu *et al.* (2005)	MER, CAR, EAR
Pterotricha lesserti Dalmas, 1921	Seyyar *et al.* (2009a)	CAR
Scotophaeus blackwalli (Thorell, 1871)	Topçu *et al.* (2005)	CAR
Scotophaeus quadripunctatus (Linnaeus, 1758)	Akpınar *et al.* (2016)	AR
Scotophaeus scutulatus (L. Koch, 1866)	Topçu *et al.* (2005)	CAR
Setaphis carmeli (O. Pickard-Cambridge, 1872)	Seyyar *et al.* (2009a)	MER
Setaphis fuscipes (Simon, 1885)	Seyyar *et al.* (2009a)	MER
Setaphis gomerae (Schmidt, 1981)	Akpınar *et al.* (2011)	MER, SAR
Setaphis parvula (Lucas, 1846)	Seyyar *et al.* (2017)	AR
Sosticus loricatus (L. Koch, 1866)	Seyyar *et al.* (2009a)	MER
Synaphosus palearcticus Ovtsharenko, Levy & Platnick, 1994	Topçu *et al.* (2005)	CAR, EAR
Trachyzelotes barbatus (L. Koch, 1866)	Topçu *et al.* (2005)	CAR
Trachyzelotes fuscipes (L. Koch, 1866)	Akpınar *et al.* (2011)	SAR
Trachyzelotes glossus (Strand, 1915)	Wunderlich (2011)	
Trachyzelotes lyonneti (Audouin, 1825)	Seyyar *et al.* (2009a)	MER, CAR
Trachyzelotes malkini Platnick & Murphy, 1984	Topçu *et al.* (2005)	CAR
Trachyzelotes pedestris (C.L. Koch, 1837)	Topçu *et al.* (2005)	CAR
Turkozelotes microb Kovblyuk & Seyyar, 2009	Kovblyuk *et al.* (2009)	MER
Urozelotes rusticus (L. Koch, 1872)	Seyyar *et al.* (2009a)	CAR
Zelotes aeneus (Simon, 1878)	Seyyar *et al.* (2009a)	CAR
Zelotes apricorum (L. Koch, 1876)	Topçu *et al.* (2005)	CAR
Zelotes atrocaeruleus (Simon, 1878)	Topçu *et al.* (2005)	CAR
Zelotes aurantiacus Miller, 1967	Topçu *et al.* (2005)	EAR
Zelotes boluensis Wunderlich, 2011 *	Wunderlich (2011)	WBR
Zelotes cingarus (O. Pickard-Cambridge, 1874)	Topçu *et al.* (2005)	CAR
Zelotes clivicola (L. Koch, 1870)	Topçu *et al.* (2005)	EAR
Zelotes daidalus Chatzaki, 2003	Varol & Akpınar (2017)	MER, SAR
Zelotes electus (C.L. Koch, 1839)	Topçu *et al.* (2005)	CAR, EAR, SAR
Zelotes erebeus (Thorell, 1871)	Akpınar *et al.* (2016)	AR
Zelotes exiguus (Müller & Schenkel, 1895)	Akpınar *et al.* (2016)	AR
Zelotes fulvaster (Simon, 1878)	Varol & Akpınar (2017)	SAR
Zelotes harmeron Levy, 2009	Seyyar *et al.* (2010)	MER
Zelotes hermani (Chyzer, 1897)	Akpınar *et al.* (2011)	SAR
Zelotes latreillei (Simon, 1878)	Topçu *et al.* (2005)	EAR, SAR
Zelotes longestylus Simon, 1914	Topçu *et al.* (2005)	CAR
Zelotes longipes (L. Koch, 1866)	Topçu *et al.* (2005)	MER, CAR, EAR
Zelotes metellus Roewer, 1928	Kovblyuk *et al.* (2009)	MER
Zelotes oblongus (C.L. Koch, 1833)	Topçu *et al.* (2005)	EAR
Zelotes olympi (Kulczyński, 1903)	Topçu *et al.* (2005)	MR
Zelotes petrensis (C.L. Koch, 1839)	Topçu *et al.* (2005)	EAR
Zelotes prishutovae Ponomarev & Tsvetkov, 2006	Ponomarev & Tsvetkov (2006)	MER
Zelotes puritanus Chamberlin, 1922	Seyyar *et al.* (2009a)	CAR
Zelotes scrutatus (O. Pickard-Cambridge, 1872)	Seyyar & Demir (2010)	AR
Zelotes segrex (Simon, 1878)	Topçu *et al.* (2005), Seyyar *et al.* (2010)	MR, MER

Zelotes similis (Kulczyński, 1887)	Topçu *et al.* (2005)	EAR
Zelotes strandi (Nosek, 1905)	Topçu *et al.* (2005)	MR
Zelotes subterraneus (C.L. Koch, 1833)	Topçu *et al.* (2005)	CAR
Zelotes talpinus (L. Koch, 1872)	Çoşar *et al.* (2018)	CAR
Zelotes tenuis (L. Koch, 1866)	Seyyar *et al.* (2006)	MER
Zelotes turcicus Seyyar, Demir & Aktaş, 2010 *	Seyyar *et al.* (2010)	MER
Zelotes wunderlichi Blick, 2017 *	Blick (2017)	EBR

* = endemic species, recorded only from Turkey [13 species].
Abbreviations used (the geographical areas in Turkey): AR = Aegean Region, CAR = Central Anatolia Region, EAR = East Anatolia Region, EBR = East Black Sea Region, MBR = Middle Black Sea Region, MER = Mediterranean Region, MR = Marmara Region, SAR = Southeast Anatolia Region, WBR = West Black Sea Region.

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Harpactea gunselorum sp. n., a new spider species from northern Cyprus (Araneae: Dysderidae)

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Abstract

A new species of the spider genus *Harpactea* Bristowe, 1939 is described from Cyprus. Detailed morphological description and photographs of both male and female specimens of the new species, *Harpactea gunselorum* sp. n., are provided. The taxonomic relationships of the new species are discussed.

Keywords: Araneae, Dysderidae, *Harpactea*, new species, taxonomy, Cyprus.

Introduction

One of the characteristic spiders' genera of the Mediterranean basin *Harpactea* Bristowe, 1939. Its members are commonly ground dwelling, known for preferring to live in hot environments, such as inland forest foliage (pine, deciduous trees, maquis shrubland, etc.). This genus is represented by 180 species today; some species such as *H. hombergi* (Scopoli, 1763) [Europe to Ukraine], *H. lepida* (C.L. Koch, 1838) [Europe to Ukraine], and *H. rubicunda* (C.L. Koch, 1838) [Europe to Georgia] are widespread while the majority's distribution is limited to a specific locality (World Spider Catalog, 2018).

The first and only *Harpactea* record known from Cyprus is *H. cecconii* (Kulczyński, 1908). Brignoli (1980) examined a series of four male and female syntypes, emphasizing that the current samples are in poor conditions and that it is not possible to examine the vulvae of female individuals of *H. cecconii*.

The famous Polish arachnologist Władysław Kulczyński studied spider samples collected from Palestine and Cyprus by the Italian entomologist Giacomo Cecconi, describing a series of spiders as new species, including *H. cecconii* (Kulczyński, 1908). The author provided the reproductive organs of the male individual of *H. cecconii* however skipped the drawings of female reproductive organs.

The purpose of this study is to describe a new *Harpactea* species as new to science with both genders, *Harpactea gunselorum* sp. n., which were collected during field studies aimed at cataloging the spider fauna of Cyprus.

Material and Methods

The specimens were collected from Beşparmak Mountains in the Northern Cyprus using a litter reducer (sifter) and pitfall traps. Digital images of the pedipalp were taken with a Leica DFC295 digital camera attached to a Leica S8AP0 stereomicroscope and 5-15 photographs were taken in different focal planes and combined. SEM microphotographs were made from dried and sputter coated (by gold) organs by use of a Zeiss Ultra Plus SEM device (Anadolu University, Eskişehir, Turkey).

All measurements are in millimetres (mm). Terminology for the body measurements and copulation organ structures follows Chatzaki & Arnedo (2006).

Abbreviations used: **Carapace and abdomen:** AL = abdominal length, CL = carapace length, CWmax & CWmin = maximum & minimum carapace width, TL = total length. **Eyes:** AME = anterior median eye, PLE = posterior lateral eye, PME = posterior median eye, AMEd, PLEd, PMEd = diameter of AME, PLE, PME. **Chelicera:** ChF = length of cheliceral fang, ChG = length of cheliceral groove, ChL = total length of chelicera (lateral external view). **Legs:** C = coxa, Fe = femur, Pa = patella, Ti = tibia, Me = metatarsus, Ta = tarsus, D = dorsal, Pl = prolateral, Rl = retrolateral, V = ventral. **Depository:** NHMNEU = Natural History Museum of Near East University, Cyprus. SMF = Senckenberg Museum, Frankfurt am Main, Germany.

Taxonomy

Family **Dysderidae** C.L. Koch, 1837
Genus ***Harpactea*** Bristowe, 1939

Harpactea gunselorum sp. n. (Figs. 1-3)
Examined material: Holotype 1♂ (NHMNEU), Cyprus, Lefkoşa, Beşparmak Mountain, Environs of Beşparmak Cave (35°17'22"N, 33°27'56"E), asl c. 426 m, 6 March 2018, Leg. S. Gücel. **Paratypes [**25♂, 8♀**]** 9♂, same data as holotype; 1♀, 7♂ (NHMNEU), Cyprus, Lefkoşa, Kalavaç Village Alevkayası (35°17'06"N, 33°31'41"E), asl c. 630 m, 13 January 2018-21 February 2018, Leg. K.B. Kunt & S. Gücel; 1♀, 4♂ (SMF), Cyprus, Beşparmak Mountain, Btw Alevkayası-Girnekayası (35°17'13"N, 33°31'01"E), asl c. 633 m, 14 January 2018-21 February 2018, Leg. K.B. Kunt & S. Gücel; 2♂ (NHMNEU), Cyprus, Beşparmak Mountains (35°17'5.99"N, 33°29'10.65"E) asl c. 558 m, 14 January 2018-22 March 2018, Leg. K.B. Kunt & S. Gücel; 1♂ (NHMNEU), Cyprus, Lefkoşa, Beşparmak Mountain, Girne Rock (35°17'03"N, 33°30'04"E), asl c. 605 m, 12 January 2018, Leg. K.B. Kunt & S. Gücel; 1♂ (NHMNEU), Cyprus, Lefkoşa, Beşparmak Mountain Environs of Beşparmak Cave (35°17'22"N, 33°27'56"E), asl c. 426 m, 15 January 2018-23 March 2018, Leg. K.B. Kunt & S. Gücel; 6♀, 1♂ (NHMNEU), Cyprus, Beşparmak Mountains, St. Hilarion Castle (35°18'56"N, 33°10'14"E), asl c. 778 m, 11 January 2018, Leg. K.B. Kunt & S. Gücel.

Derivatio nominis: The new species is dedicated to the honour of “Günsel Family” who is the founder of the Near East University in Cyprus.

Diagnosis: *Harpactea gunselorum* sp. n. is easily separated from other members of the genus because of the uniqueness of the bellows-shaped haematodocha folds located at the base of the "embolus from the bulb's distal extensions" and the cylindrical shape of the embolus in the male reproductive organ. The new species is closely related to *Harpactea heliconia* Brignoli, 1984 and *Harpactea rubicunda* (C.L. Koch, 1838) widely known from Greece (Boeotia) in terms of general appearance, anterior spermatheca parts ratios, and large posterior diverticulum of the female reproductive organ parts.
Measurements [Holotype ♂ / Paratype ♀]**:** TL 4.25 / 4.10; AL 2.40 / 2.50; CL 1.85 / 1.60; CWmax 1.50 / 1.25; CWmin 0.70 / 0.62; AMEd 0.11 / 0.12; PLEd 0.11 / 0.10; PMEd 0.07 / 0.07; ChF 0.35 / 0.32; ChG 0.24 / 0.20; ChL 0.82 / 0.64. Leg measurements are given in Table (1).

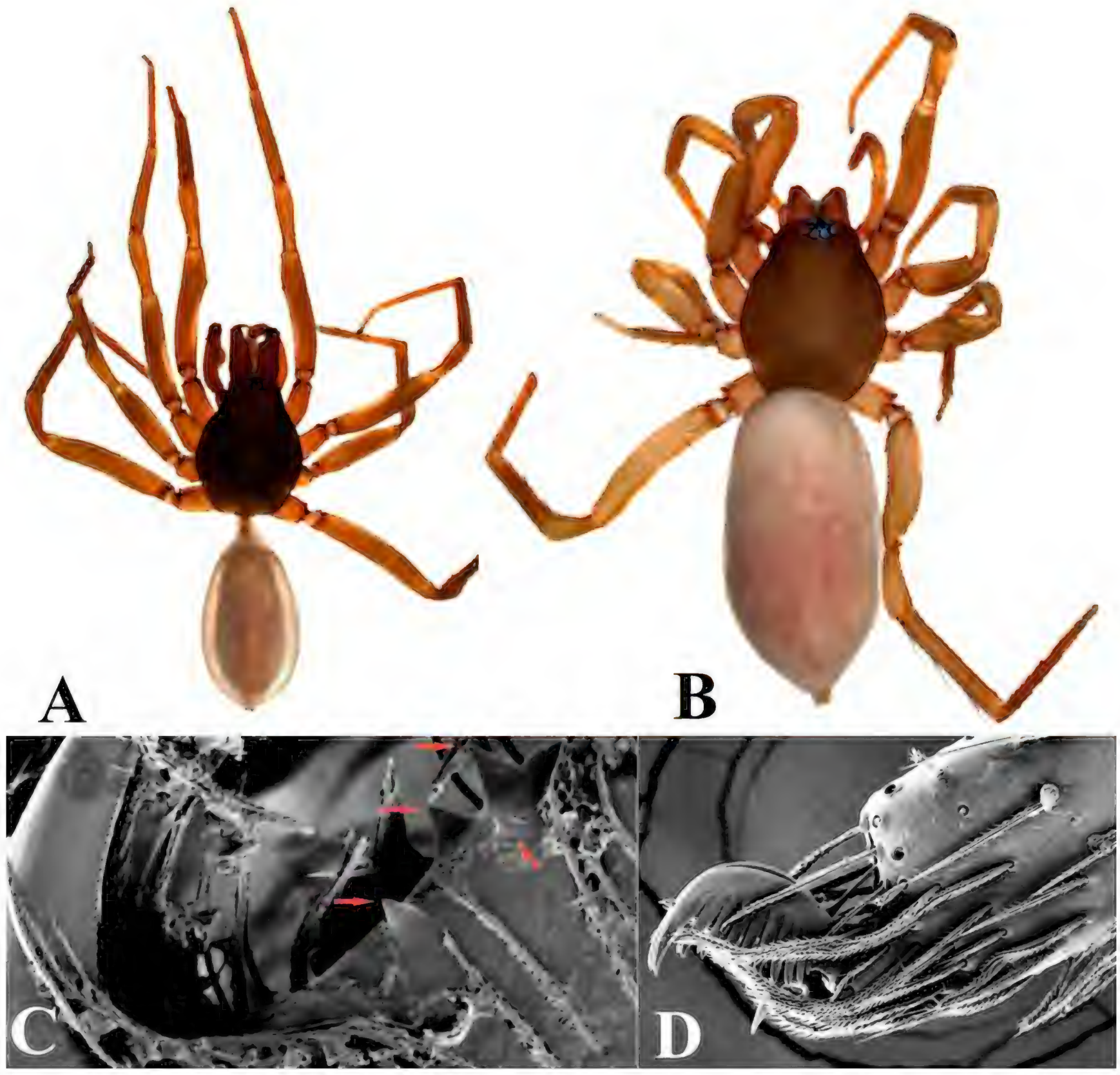

Fig. 1. *Harpactea gunselorum* sp. n. A-B. Habitus, dorsal view.
A. male. B. female. C. Cheliceral teeth. D. Tarsal claws, leg I.

Table 1. Leg measurements of *Harpactea gunselorum* sp. n. (Holotype ♂ / Paratype ♀).

Legs	Fe	Pa	Ti	Me	Ta	TL
I	1.50 / 1.25	1.00 / 0.65	1.50 / 1.00	1.25 / 0.90	0.35 / 0.30	5.60 / 4.10
II	1.50 / 1.10	0.95 / 0.72	1.25 / 0.85	1.25 / 0.75	0.40 / 0.30	5.35 / 3.72
III	1.25 / 1.00	0.63 / 0.50	0.88 / 0.75	1.20 / 0.90	0.40 / 0.30	4.36 / 3.45
IV	1.85 / 1.25	0.90 / 0.65	1.50 / 1.20	1.75 / 1.35	0.50 / 0.30	6.50 / 4.75

Description: Small-sized harpacteinae spiders. Carapace brownish, khaki, with smooth surface. Fovea extremely prominent, in the form of a black line. Cephalic region narrower than thoracic region. There is no obvious colour difference between the two regions. However, the edges of the carapace are darker and browner as the contour rises. In males, there are weak hairs on the dorsal side of the carapace. These hairs are also present in females but are much less frequent. Six eyes; well-developed silvery greyish colours and ring sequenced. AME's light. Chelicerae, cheliceral teeth, gnathocoxae and labium are very light brown. There are short, weak brownish hairs on the anterior of the chelicerae that are generally equally spaced, coming out of blackish holes. These hairs are elongating while going down the cheliceral teeth. The outer basal parts of the cheliceral teeth have long hairs in clusters. Sternum brownish yellow, with smooth and bright surface. There are fine brownish hairs on the sternum. These hairs are longer towards the dark brown edges of the sternum. In particular, they have formed a tuft on the edge of the sternum posterior tip towards the pedicel.

Legs yellowish brown. There are no difference in colouration between segments of anterior and posterior legs in both sexes.

Table 2. Leg spination of *Harpactea gunselorum* sp. n.

♂ (Holotype)	Leg I	Leg II	Leg III	Leg IV
C	0	0	1 Pl	1 Pl
Fe	2 Pl	1, 1 Pl	1, 1 Rl 1 D	1, 1 Pl 1 D
Pa	0	0	1 Rl	0
Ti	0	0	1, 1, 1 Rl 1, 1 Pl 1, 1, 2 V	1, 1, 1 Rl 1, 1, 1 Pl 1, 1 2 V
Me	0	0	1, 1, 1 Rl 1, 1 Pl 2 V	4 Rl 1, 1, 1 Pl 2 V
♀ (Paratype)				
C	0	0	1-2 Pl	1 Pl
Fe	2 Pl	1, 1 Pl	1, 1 Rl 1 D	1 D
Pa	0	0	1 Rl	0
Ti	0	0	1, 1, 1 Rl 1, 1 Pl 1, 1, 2 V	1, 1 Rl 1, 1 Pl 1, 1 2 V
Me	0	0	1, 1, 1 Rl 1, 1 Pl 2 V	4 Rl 1, 1, 1 Pl 1, 1 2V

The surfaces of all leg segments are covered with blackish hair. Anterior and posterior femora and posterior coxae with spines prolaterally. For detailed spination see Table (2). Anterior tarsi without claw tuft, and with 3 claws. The posterior tarsi also have very weakly developed claw tuft and with 3 claws. The front tarsal claws on all legs carry 9-10 teeth. There are weak scopulae on the first quarters of tarsi and metatarsi of the posterior legs. Abdomen greyish-pale brown, cylindrical. Its surface is covered with weak, blackish hairs. These hairs are denser on the ventral side of the abdomen, while getting less on the dorsal surface.

Male bulb oval, brownish orange. Distal expansions blackish and short like a tubercle at the tip of the bulb. Embolus and conductor are not easily distinguishable from each other. The accessory apophysis is absent.

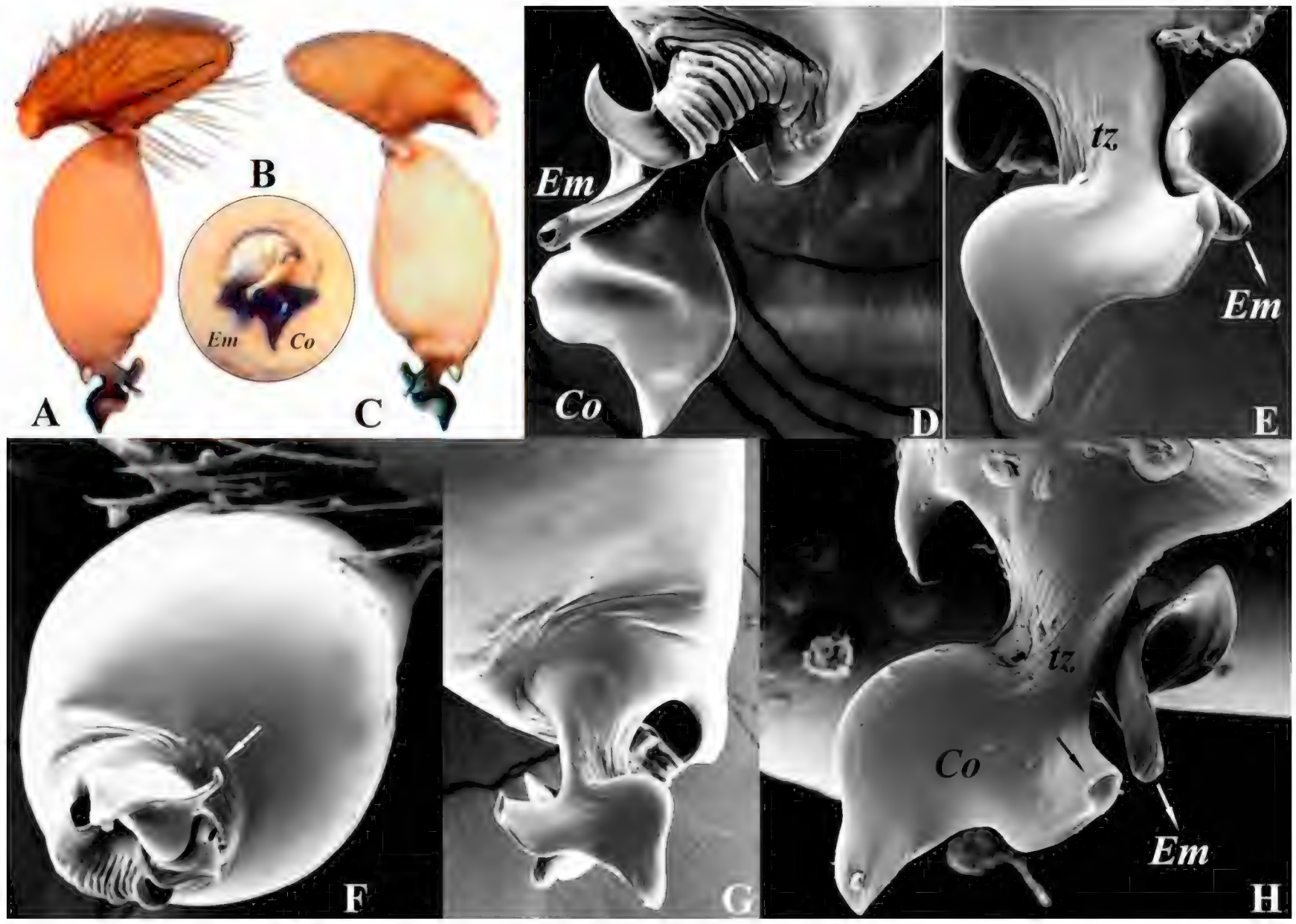

Fig. 2. Male palp of *Harpactea gunselorum* sp. n. A. Prolateral view. B. Dorsal view. C, D. Retrolateral view. E, H. Nearly prolateral view. F. Nearly dorsal view. G. Nearly retrolateral view. *Co* = Conductor, *Em* = Embolus, *tz* = Transition zone.

Fig. 3. Vulva of *Harpactea gunselorum* sp. n. A. Dorsal view. B. Ventral view. *dc* = Distal crest, *des* = Distal expansion of the spermatheca, *Pd* = Posterior diverticulum.

The base of embolus is composed of folds of haematodocha in the form of bellows and the sclerotized first fold is in the shape of a finger and led to the bulb's apex. The other end where the sperm duct exit is cylindrical; toward eight o`clock in the posterior side. There is an obvious transitional zone between the conductor and the bulb. After this transition zone, the expanding conductor shrinks suddenly towards the tip. The anterior side of the conductor is circular and wide; posterior edge is folded toward the prolateral side. At the distal end, there is also a slight curve towards the prolateral side.

Generally, vulva is weakly sclerotized. Only the basal transverse part of the anterior spermatheca appears to be more strongly sclerotized than the other parts. Basal transverse part of the anterior spermatheca is also fused with the anterior basal arc at the same time. Distal crest is spinose. There is no difference in width between the basal transverse part of the anterior spermatheca and the distal expansion of the spermatheca. The length of the transverse bar is half the length of the anterior basal arc. Posterior diverticulum is membranous and widened.

Results

According to the classification of Deeleman-Reinhold (1993), *Harpactea gunselorum* sp. n., is evaluated to be within the ***rubicunda* (D) species group**. This assessment has been done:

1. Embolus and conductor are massive in males. Especially the embolus is complicated.
2. The vulva has a wide and membranous posterior diverticulum.
3. Coxae IV and patellae III with one spine.

According to the present faunistic records, the only *Harpactea* species known from Cyprus is *H. cecconii* (Bosmans *et al.*, 2016). However, 5 *Harpactea* species from North Aegean islands, 4 from Crete and Sardinia, and 2 from Corsica have been identified (Helsdingen, 2018).

Apart from *Harpactea corticalis* (Simon, 1882), which has relatively broad distribution (France and Italy), others are endemic to the islands. *H. gunselorum* sp. n. is widely distributed through out the Beşparmak mountains, however its distribution from the southern part of Cyprus is as yet undetermined. Future arachnological studies will help to understand *H. gunselorum* sp. n. both taxonomic situation in the genus and the distribution on the island.

Acknowledgments

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Harpactea gunselorum **Gücel, Fuller, Göçmen & Kunt, 2018**
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Dysdera neocretica Deeleman-Reinhold, 1988, a new record from Turkey (Araneae: Dysderidae)

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Abstract

Dysdera neocretica Deeleman-Reinhold, 1988 is recorded for the first time from Turkey. Its characteristic features and photographs are presented. The total number of species belonging to genus *Dysdera* recorded from Turkey reached 28 including 13 endemic species.

Keywords: Spiders, Dysderidae, *Dysdera neocretica,* new record, Turkey.

Introduction

Family Dysderidae is represented by 24 genera and 567 species in the World (World Spider Catalogue, 2018). Of these, 284 species belong to genus *Dysdera* Latreille, 1804. Within Turkish spider fauna, Dysderidae is represented by 55 species of 7 genera, of these 22 species belong to genus *Dysdera* (Danışman *et al.*, 2018). In another checklist of Turkish spider fauna Demir & Seyyar (2017), Dysderidae is represented by 60 species of them 23 species belong to genus *Dysdera*; in addition to more 5 species recently recorded from Turkey: *Dysdera dunini* Deeleman-Reinhold, 1988 and *Dysdera krisis* Komnenov & Chatzaki, 2016 (Varol & Danışman, 2017), *Dysdera furcata* Varol & Danışman, 2018, *Harpactea forceps* Varol & Danışman, 2018, and *Dysdera galinae* Dimitrov, 2018.

Turkish fauna should be much richer and many new taxa are expected to be recorded in the future. In this paper, one dysderid species: *Dysdera neocretica* Deeleman-Reinhold, 1988 is added to the spider fauna of Turkey to increase the *Dysdera* species of Turkey to 27 species (Table 1).

Material and Methods

Two males and one female specimens were examined in this study. These specimens were collected during the day by hand aspirator in a tea garden in Muğla province, Datça district, Özbel (36°43'35"N, 27°41'09"E, elev. 10m), on 31 January 2018. The specimens were preserved in 70% ethanol. Pictures were taken using a Leica DC 160 digital camera attached to a LEICA S8APO stereomicroscope. Some photographs were combined using CombineZP. Paint software was used for enhancing photographic images. Identification of the species depended on Deeleman-Reinhold & Deeleman (1988) and Nentwig *et al.* (2018). All measurements are in millimetres. The specimens were deposited in the collection of the Arachnological Museum of Kırıkkale University (KUAM).

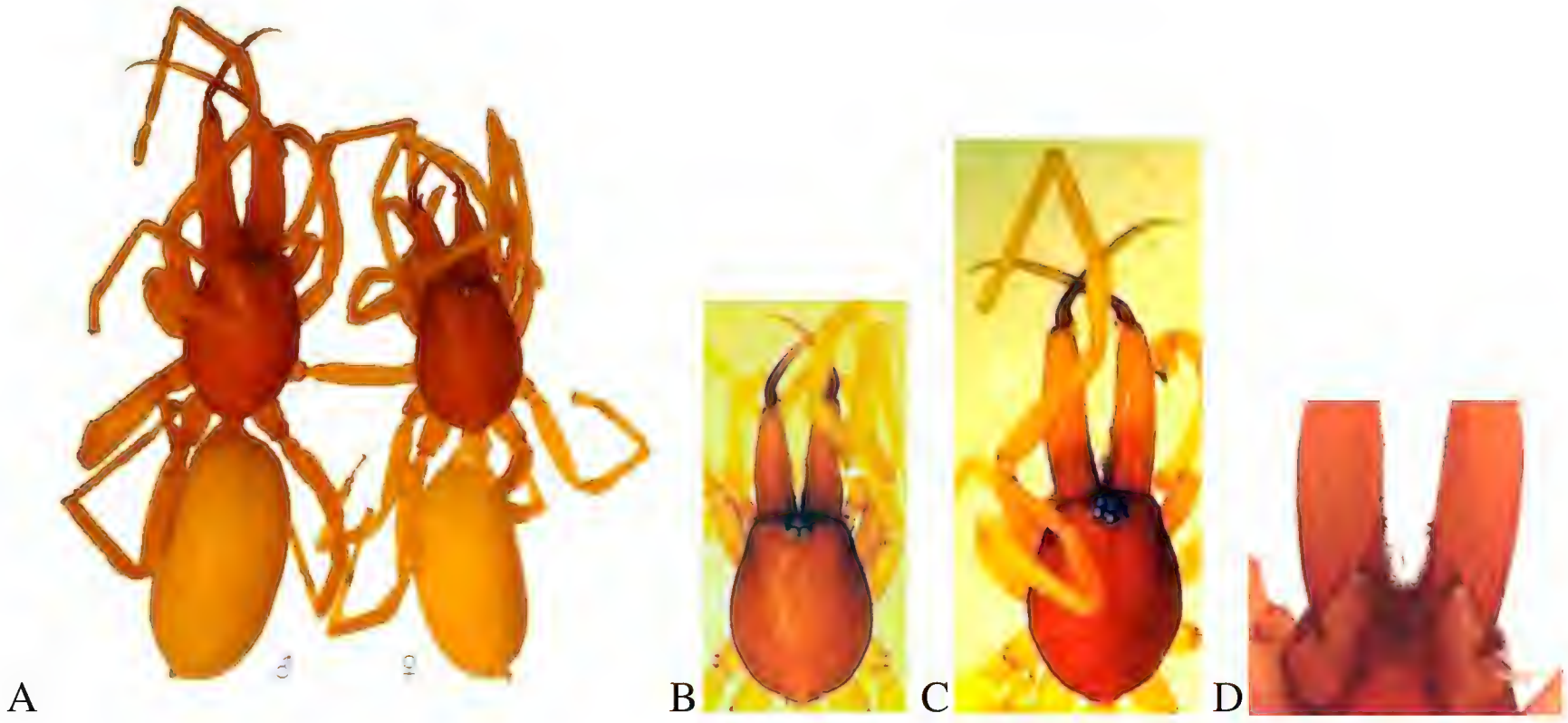

Fig. 1. *Dysdera neocretica* Deeleman-Reinhold, 1988 A. Habitus, dorsal view of male and female. B-C. Prosoma and chelicerae, dorsal view. B. Female. C. Male. D. Male, lower part of chelicerae, ventral view.

Results

Dysdera neocretica Deeleman-Reinhold, 1988 (Figs. 1-2)

Material examined: 2♂, 1♀; Muğla province, Datça district, Özbel locality, 31.01.2018.

Diagnosis: Small species. Prosoma is golden-brown, abdomen yellow. Chelicerae strong, slightly outward, up to 2/3 of the prosoma. Proximal part has regular long hairs containing sclerotic base. Posterior median eyes diameter is equal to the diameter of the laterals. The sternum is bulging.

Male description: Total length 5.0, Prosoma 1.9 long, 1.4 wide, Opisthosoma 3.1 long, 1.0 wide. A thin sclerotic layer is present in the epigastric region. The tegulum is bigger than the bulbus. The sperm duct is clearly visible. The distal part has two different tips. Posterior apophysis is white, thumb-like flat. The apical part is dark brown-black with scissors shape on the terminal part.

Female description: Total length 4.6, Prosoma 1.7 long, 1.2 wide, Opisthosoma 2.9 long, 0.9 wide. Spermatheca is as wide as an anteroventral valve, posterodorsal valve is much wider. Posterodorsal valve ends have triangular elevation, open side up straight. The seminal receptacle is elevated in superior wing shaped.

Distribution: Greece (Crete) (World Spider Catalog, 2018).

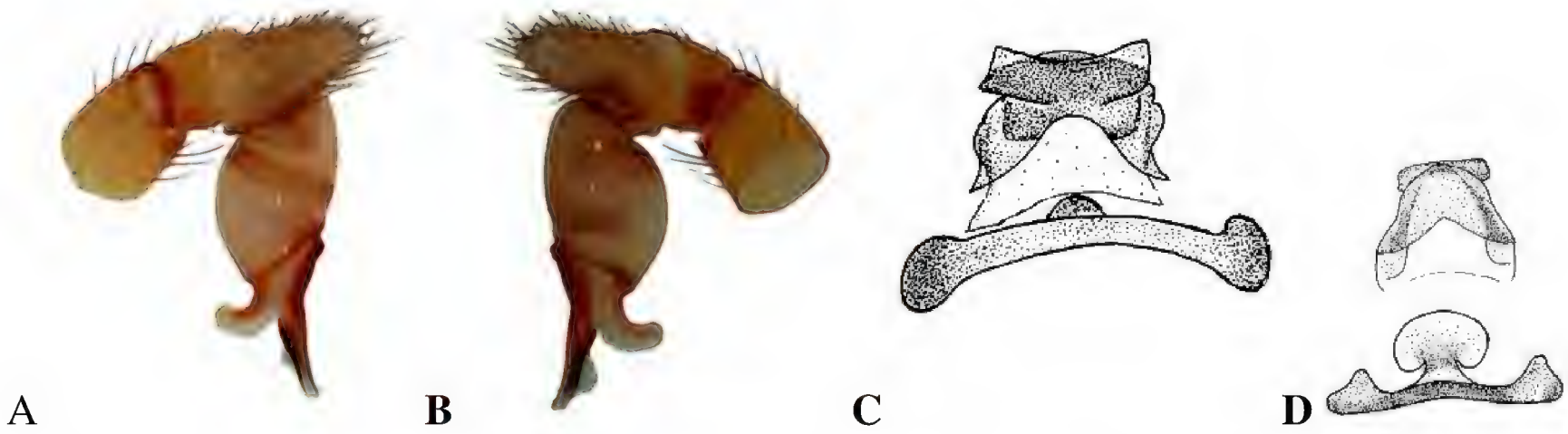

Fig. 2. *Dysdera neocretica* Deeleman-Reinhold, 1988 A-B. Male palp. A. Dorsal (lateral) view. B. Ventral (median) view. C-D. Female vulva. C. Ventral view. D. Dorsal view (anterior and posterior diverticula) (After Deeleman-Reinhold & Deeleman 1988).

Table 1. Turkish species of genus Dysdera (* = endemic species).

Dysdera akpinarae Varol, 2016 *	*Dysdera lata* Reuss, 1834
Dysdera anatoliae Deeleman-Reinhold, 1988 *	*Dysdera longimandibularis* Nosek, 1905
Dysdera argaeica Nosek, 1905 *	*Dysdera longirostris* Doblika, 1853
Dysdera asiatica Nosek, 1905	*Dysdera maurusia* Thorell, 1873
Dysdera crocata C.L.Koch, 1838	*Dysdera mixta* Deeleman-Reinhold, 1988 *
Dysdera dunini Deeleman-Reinhold, 1988	*Dysdera neocretica* Deeleman-Reinhold, 1988
Dysdera enguriensis Deeleman-Reinhold, 1988 *	*Dysdera ninnii* Canestrini, 1868
Dysdera erythrina (Walckenaer, 1802)	*Dysdera rubus* Deeleman-Reinhold, 1988
Dysdera furcata Varol & Danışman, 2018 *	*Dysdera sultani* Deeleman-Reinhold, 1988
Dysdera galinae Dimitrov, 2018 *	*Dysdera tezcani* Varol & Akpinar, 2016 *
Dysdera gruberi Deeleman-Reinhold, 1988 *	*Dysdera topcui* Gasparo, 2008 *
Dysdera hattusas Deeleman-Reinhold, 1988 *	*Dysdera turcica* Varol, 2016 *
Dysdera kollari Doblika, 1853	*Dysdera westringi* O.Pickard-Cambridge, 1872
Dysdera krisis Komnenov & Chatzaki, 2016	*Dysdera yozgat* Deeleman-Reinhold, 1988 *
28 species (13 endemic)	

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Three new *Clubiona* records for the spider fauna of Turkey (Araneae: Clubionidae)

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Abstract

Three clubionid species: *Clubiona frutetorum* L. Koch, 1867, *Clubiona genevensis* L. Koch, 1866, and *Clubiona similis* L. Koch, 1867 are reported from Turkey for the first time. All species are illustrated. In total, 13 species of Clubionidae belonging to one genus, *Clubiona*, are now known from Turkey.

Keywords: Spider, *Clubiona*, Clubionidae, new record, Turkey.

Introduction

Clubionidae spider family is represented by 15 genera and 618 species worldwide (World Spider Catalog, 2018). Within Turkish spider fauna, with a total of 52 families and 1117 species, Clubionidae is represented by 10 species of 1 genus, *Clubiona* (Danişman *et al*., 2018; Demir & Seyyar, 2017). In this study, we add three spider species to the spider fauna of Turkey.

Material and Methods

This study is based on the material collected from different regions of Turkey. Specimens were collected by means of hand aspirators, under stones and on plants. Identifications were made by use of Leica S8APO stereomicroscope. The key of Heimer & Nentwig (1991) was used. Specimens were photographed using a Leica DC160

camera attached to a Leica S8AP0 stereomicroscope. Images were montaged using "CombineZM" image stacking software and "Photoshop CS5" image editing software. Measurements are given in millimetres. All specimens are preserved in 70% ethanol and deposited in the collection of the Arachnological Museum of Kırıkkale University (KUAM).

Results

Clubiona frutetorum L. Koch, 1867

Material examined: 2♀, Kırıkkale Province, Yahşihan district (39°50'42"N, 33°26'54"E), 25.05.2012.

Female description: Total length 5.30. Carapace length 2.10, width 1.50. Abdomen length 3.20, width 2.0. Prosoma light brown. Ocular area darker brown, with short bright hairs. Chelicerae brown, with few short dark colour hairs dorsally. Abdomen yellowish white, with brown patterns. All legs yellow (Figs. 1-3). Epigyne and vulva as in figures (4-5). Epigyne lip with sclerotized spermathecae situated anteriorly.

Distribution: Europe to Central Asia (World Spider Catalog, 2018).

Clubiona genevensis L. Koch, 1866

Material examined: 2♂, Mardin Province, Artuklu district, Sultan village (37°27'16"N, 40°37'11"E), 08.05.2018.

Male description: Total length 4.20. Carapace length 2.20, width 1.36. Abdomen length 2.0, width 1.50. Prosoma light brown, darkens to the front (Figs. 6-7). Ocular area light brown. Chelicerae brown, with long dark hairs on the lateral side (Fig. 8). Abdomen dark brown, with white patterns. All legs are yellow. Male palps as in Figs. (9-11). Palpal retrolateral tibial apophysis triangular, with rounded tip. Modified cymbial setae with well developed, sub-basal swelling with plate shape.

Distribution: Europe, Caucasus, Russia to Central Asia, China (World Spider Catalog, 2018).

Clubiona similis L. Koch, 1867

Material examined: 1♂, 1♀, Bursa Province, Osmangazi district (40°17'47"N, 29°01'19"E), 07.06.2015.

Male description: Total length 3.70. Carapace length 1.70, width 1.30. Abdomen length 2.0, width 1.10. Prosoma light brown, with short bright hairs (Figs. 12-13). Ocular area light brown. Chelicerae brown with long light colour hairs dorsally (Fig. 16). Abdomen greyish brown, its anterior part light yellowish brown, with long dark hairs. All legs are yellowish brown, with thick dark colour hairs. Palpal tibial apophysis with U-shaped projecting branch. Male palps as in Figs. (18-20).

Female description: Total length 7.70. Carapace length 3.0, width 1.50. Abdomen length 4.70, width 1.80. Prosoma light brown, with bright hairs (Figs. 14-15). Ocular area light brown, with intensely bright hairs. Chelicerae dark brown with short dark colour hairs dorsally (Fig. 17). Abdomen grey, with four dark spots in the middle. All legs yellowish brown, with thick dark colour hairs. Copulatory opening slot shaped. Epigyne and vulva characteristic, as in Figs. (21-22).

Distribution: Europe (World Spider Catalog, 2018).

Figs. 1-2. *Clubiona frutetorum* ♀, habitus. 1. dorsal view. 2. ventral view. (Scale: 1.0).

Fig. 3. *Clubiona frutetorum* ♀, ocular area, frontal view. (Scale: 0.5).

Figs. 4-5. *Clubiona frutetorum* ♀. 4. epigyne, ventral view. 5. vulva, dorsal view. (Scale: 0.5).

Figs. 6-7. *Clubiona genevensis* ♂, habitus. 6. dorsal view. 7. ventral view. (Scale 1.0).

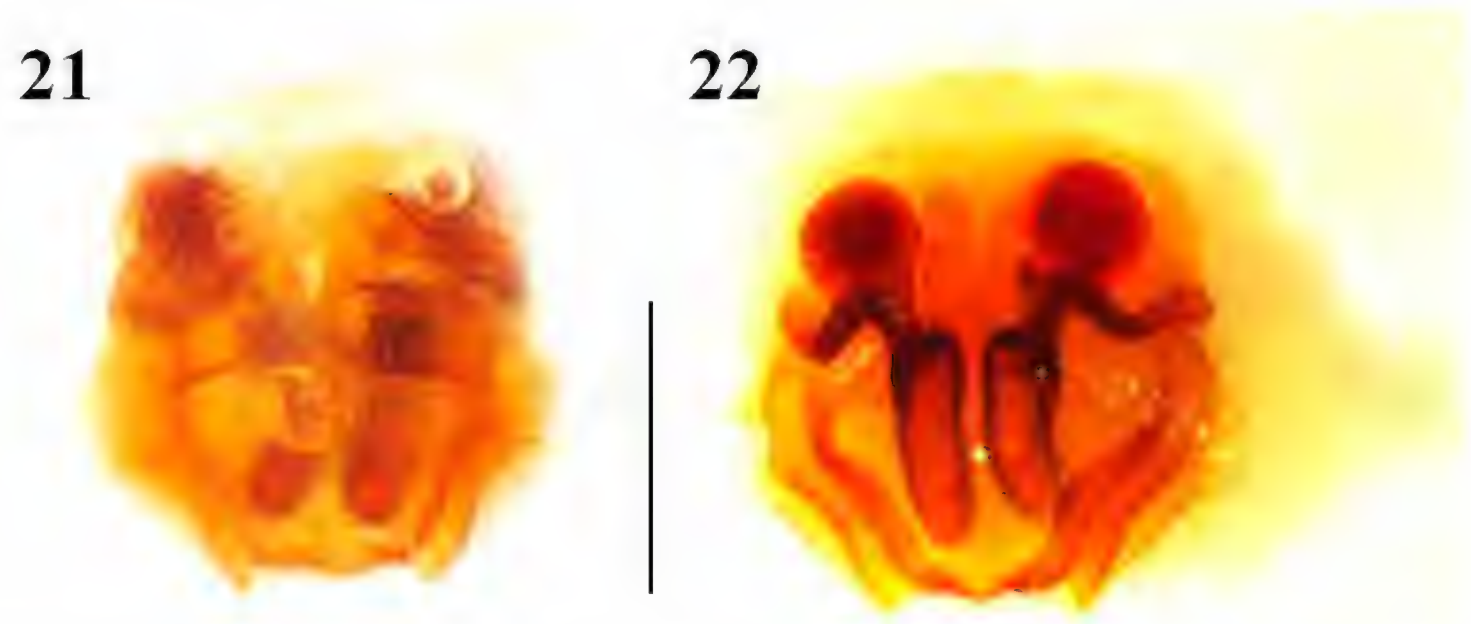
Fig. 8. *Clubiona genevensis* ♂, ocular area, frontal view. (Scale: 0.5).

Figs. 9-11. *Clubiona genevensis* ♂, pedipalp. 9. retrolateral view. 10. ventral view. 11. prolateral view. (Scale: 0.5).

Figs. 12-15. *Clubiona similis*, habitus. ♂, 12-13. ♀, 14-15. 12, 14. dorsal view. 13, 15. ventral view. (Scale: 1.0).

Figs. 16-17. *Clubiona similis*, ocular area, frontal view. 16. ♂. 17. ♀. (Scale 0.5).

Figs. 18-20. *Clubiona similis* ♂, pedipalp. 18. retrolateral view. 19. ventral view. 20. prolateral view. (Scale: 0.5).



Figs. 21-22. *Clubiona similis* ♀. 21. epigyne, ventral view. 22. vulva, dorsal view. (Scale: 0.5).

Now, the fauna of Turkey contains thirteen species of genus *Clubiona*. In comparison to countries such as Greece (18), Germany (28), France (31), or Italy (29) (Helsdingen, 2018), the species diversity of Turkish clubionids is rather low. The actual richness expected of Turkish clubionids is without doubt certainly much higher than 20.

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A new spider record of genus *Thomisus* Walckenaer, 1805 (Araneae: Thomisidae) from India

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Abstract

The thomisid spider species, *Thomisus unidentatus* Dippenaar-Schoeman & van Harten, 2007 was previously reported from Yemen, Iraq and Iran. In this paper, we report male of this crab spider from India. A detailed taxonomic description of the male is provided here along with comments on taxonomic variations.

Keywords: Spider, first record, taxonomy, *Thomisus unidentatus,* India.

Introduction

The crab spider family Thomisidae Sundevall, 1833 is represented by 170 genera and 2164 species in the world (World Spider Catalog, 2018). The family is poorly studied in India and till date only 38 genera and 175 species of this family are reported from India (World Spider Catalog, 2018). The genus *Thomisus* Walckenaer, 1805 was first reported from India more than one and half century ago (Doleschall, 1859). The genus is spacious and includes 145 species from all over the world, of these only 46 species have been reported from India (World Spider Catalog, 2018). However, *Thomisus cherapunjeus* Tikader, 1966 has been transferred from genus *Thomisus* to *Runcinia* (Lehtinen, 2004). In this paper we report *Thomisus unidentatus* Dippenaar-Schoeman & van Harten, 2007 for the first time from India based on males. This species was

previously reported from Yemen, Iraq, and Iran (Dippenaar-Schoeman & van Harten, 2007; Seyyar *et al.*, 2016; Kiany *et al.*, 2017; World Spider Catalog, 2018).

Material and Methods

The specimens were collected by hand picking and preserved in 70% ethyl alcohol with little glycerine. Measurements of body parts were taken with a Mitutoyo™ Vernier calliper. Leg measurements were taken dorsally for the left side. All measurements were taken in millimetres. Genitalia were dissected and cleared in concentrated lactic acid in 100°C water bath for 15-20 minutes. Images were taken by a digital camera attached to an Olympus SZX10 stereo zoom microscope.

Abbreviations used: AL = abdomen length, ALE = anterior lateral eye, AME = anterior median eye, AW = abdomen width, BTA = basal tibial apophysis, CL = cephalothorax length, CW = cephalothorax width, MA = median apophysis, MOQ = median ocular quadrangle, PLE = posterior lateral eye, PME = posterior median eye, RTA = retrolateral tibial apophysis, TL = total length. All specimens were deposited at Indraprastha University Museum (IPUM), New Delhi, India.

Taxonomy

Thomisidae Sundevall, 1833

Thomisus Walckenaer, 1805

Thomisus unidentatus Dippenaar-Schoeman & Van Harten, 2007: 180, f. 27-29 (D♂♀).
Thomisus unidentatus Seyyar *et al.*, 2016: 221, f. 2a-f (♂♀).
Thomisus unidentatus Kiany *et al.*, 2017: 4, f. 8a-e (♂♀).

Material examined: 1♂, IPU-18-Arach-1345, Aravalli Biodiversity Park, Delhi, India (28°32'46.78"N, 77°12'34.83"E), 23.02.2018, Coll. Diksha; 2♂, IPU-Arach-1346, IPU-Arach-1347, Okhla Bird Sanctuary, Uttar Pradesh, India (28°32'56.3"N, 77°18'56.6"E), 08.03.2018, Coll. Diksha; 1♂, IPU-Arach-1348, same locality, 22.04.2018; 1♂, IPU-18-Arach-1380, Najafgarh Jheel, Delhi, India (28°32'06.01"N; 76°52'11.03"E), 16.02.2018, Coll. Ruhi Asra Khan.

Description, Male (Figs. 1-8): Small in size (n=5): TL 2.07-3.36±0.55, CL 0.90-1.46±0.22, CW 0.97-1.49±0.22, AL 1.17-1.90±0.30, AW 1.12-1.80±0.25.

Carapace: Yellowish brown at middle and flanked by dark brown broad lateral bands, almost as wide as long wide, thoracic area broader than cephalic area, cephalic region narrowed in front with slivery spectacular protuberance. Thoracic region with white seta-bearing tubercles, arranged in rows radiating from fovea (Fig. 1). Eight eyes, all blackish except anterior medians which are brownish, lateral eyes present on conical protuberances on each side. Eyes arranged in two recurved rows, anterior row strongly recurved and posterior row slightly. Eyes in each row are of equal size, but anterior row eyes are slightly larger than posterior row eyes. MOQ is slightly wider behind than the front (Figs. 1,3). Eyes inter-distances: AME-ALE 0.17±0.02, AME-AME 0.16±0.01, PME-PME 0.27±0.01, PME-PLE 0.19±0.05, AME-PME 0.18±0.01. Labium dark yellow, slightly longer than wide and narrower towards apex, endites also dark yellow and whitish at apex, cylindrical and almost double in length than width, sternum shield-shaped, yellowish, convex and longer than wide, fangs without tooth (Figs. 2,4). Legs translucent and yellow in colour. Femur of legs I and II are with brownish lateral bands. Tibia and tarsus of legs I and II are dark brownish in colour. Leg formula 1243 (Figs. 1-2, Table 1).

1

3

6

8

2

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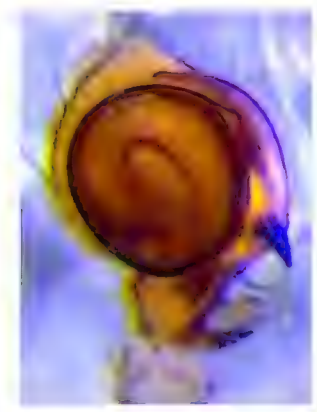

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Figs. 1-8. *Thomisus unidentatus* ♂. 1-2. Habitus. 1. dorsal view. 2. ventral view. 3. Eye arrangement. 4. Sternum, endites and labium. 5. Spinnerets. 6-8. Left palp. 6. retrolateral view. 7. ventral view. 8. prolateral view. Scale: (for 1-5) 1.0 mm, (6-8) 0.2 mm.

Table 1. Leg morphometry of *Thomisus unidentatus* ♂ (range ± SD) (n = 5)

	Leg I	Leg II	Leg III	Leg IV	Palp
Femur	0.92-1.27±0.14	0.92-1.15±0.08	0.33-0.59±0.10	0.29-0.62±0.13	0.15-0.26±0.04
Patella	0.27-0.48±0.08	0.27-0.50±0.08	0.17-0.26±0.03	0.17-0.28±0.04	0.12-0.18±0.02
Tibia	0.65-0.96±0.12	0.67-0.87±0.07	0.23-0.38±0.06	0.27-0.42±0.05	0.09-0.12±0.01
Metatarsus	0.52-0.81±0.12	0.56-0.71±0.07	0.22-0.34±0.04	0.31-0.44±0.05	-
Tarsus	0.43-0.53±0.03	0.37-0.52±0.06	0.17-0.31±0.05	0.25-0.40±0.05	0.35-0.42±0.02
Total	2.97-3.98±0.40	2.93-3.51±0.22	1.14-1.88±0.27	1.44-1.99±0.23	0.75-0.89±0.05

Abdomen: Slightly longer than wide. Dorsally whitish yellow, with abdominal tubercles and seven median dark yellow spots, the anterior one single followed by other three pairs. Dorsal side also flanked by numerous irregular white spots anteriorly and laterally (Fig. 1). Ventrally yellowish in colour, flanked by dark patches laterally above spinnerets (Fig. 2). Spinnerets three pairs, both anterior and posterior median spinnerets are thick, conical and narrowly separated from each other, lateral spinnerets are narrow and elongated, colulus present (Fig. 5).

Palp (Figs. 6-8): Embolus long and slender originating from lower part of cymbium, tegulum with a downwardly directed MA, tibia with two apophyses; a straight and pointed BTA and a RTA that is curved and pointed at the tip.

Variations: In specimens of Yemen, legs I and II are equal in length (Dippenaar-Schoeman & van Harten, 2007), but in Indian specimens leg I is slightly longer than leg II (Figs. 1-2, Table 1). Palp on ventral view, RTA is at 12 O'clock position in specimens of Yemen (Dippenaar-Schoeman & van Harten, 2007), but at 1 O'clock position in Indian specimens like Iraq and Iran (Fig. 7) (Seyyar *et al.*, 2016; Kiany *et al.*, 2017).

Natural history: This species is commonly found on flowers.

Distribution: Yemen, Iraq, Iran and India (Delhi and Uttar Pradesh, present record).

Acknowledgments

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Mesiotelus alexandrinus (Simon, 1880) is a junior synonym of *Mesiotelus tenuissimus* (L. Koch, 1866) (Araneae: Liocranidae)

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Abstract

The holotype female of *Mesiotelus alexandrinus* (Simon, 1880) could be compared with females of *Mesiotelus tenuissimus* (L. Koch, 1866), captured together with male, and it appears they are identical. Thus, *Mesiotelus alexandrinus* (Simon, 1880) = *Mesiotelus tenuissimus* (L. Koch, 1866) **N. Syn.** Illustrations of both male and female *M. tenuissimus* are presented in addition to its distribution in Egypt.

Keywords: Spiders, Araneae, *Mesiotelus tenuissimus*, Liocranidae, Egypt.

Introduction

The genus *Mesiotelus* actually includes 15 species occurring in Europe, Asia, and Africa (World Spider Catalog, 2018). Since its first description, *Mesiotelus alexandrinus* (Simon, 1880) has not been cited again, except for catalogues. The first author was able to examine the type material of this species. Without the examination of the type material, it was not possible to evaluate the validity of *Mesiotelus alexandrinus* depending on its description by Simon (1880) that included nothing about the genitalia.

The study of the Egyptian spiders is slowly proceeding. One of the main difficulties of identification of species is the need to examine type material, especially of the species described only once and its description has no illustrations like the case of *Mesiotelus alexandrinus*. The result of the examination of the type material is the synonymy between *Mesiotelus alexandrinus* and *Mesiotelus tenuissimus*.

Abbreviations used: NHML = Natural History Museum, London, UK; MNHNP = Muséum National d'Histoire naturelle de Paris, France.

Taxonomy

Genus ***Mesiotelus*** Simon, 1897
Type species: *Mesiotelus tenuissimus* (L. Koch, 1866)

Mesiotelus tenuissimus (L. Koch, 1866) Figs. 1 a-f; 2 a-e.
Cheiracanthium tenuissimum L. Koch, 1866: 237, pl. 9, fig. 154 (descr. ♂).
Liocranum alexandrinum Simon, 1880: 99 (descr. ♀) **N. Syn.**

Type material
Holotype ♂ of *Mesiotelus tenuissimus* from Greece, Naxos (NHML, B nr 1890 7.1.1271); examined.
Holotype ♀, *Liocranum alexandrinum* from Egypt, Edko near Alexandria, Letourneux leg. (MNHNP); examined; accompanied by 1♂ belonging to the same species, not mentioned in the original description.

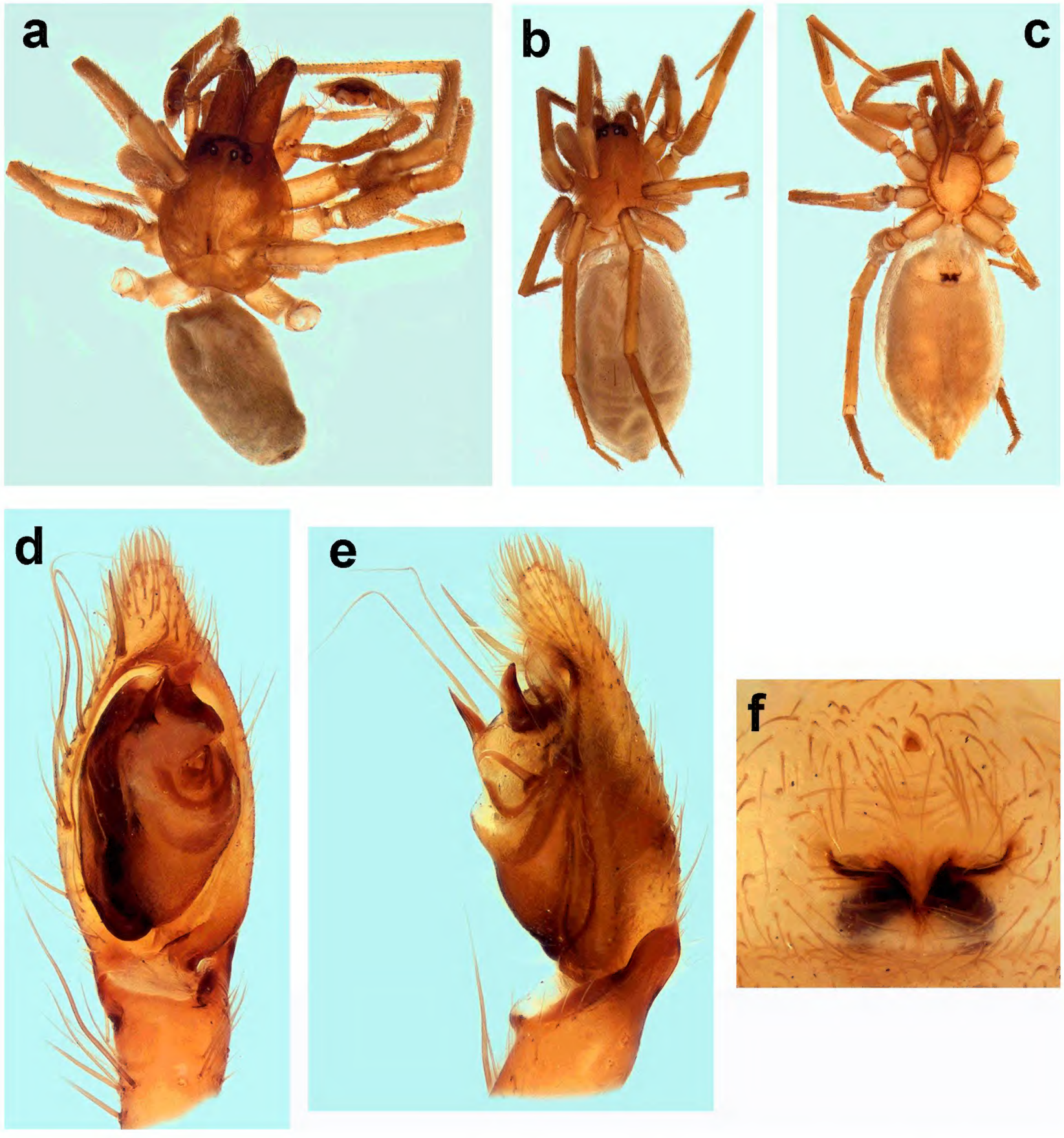

Fig. 1. a-f. *Mesiotelus tenuissimus* (L. Koch, 1866) [from France, Carcassonne]. a. ♂, dorsal view. b-c. ♀. b. dorsal view. c. ventral view. d-e. ♂ palp. d. ventral view. e. lateral view. f. ♀ epigyne, ventral view.

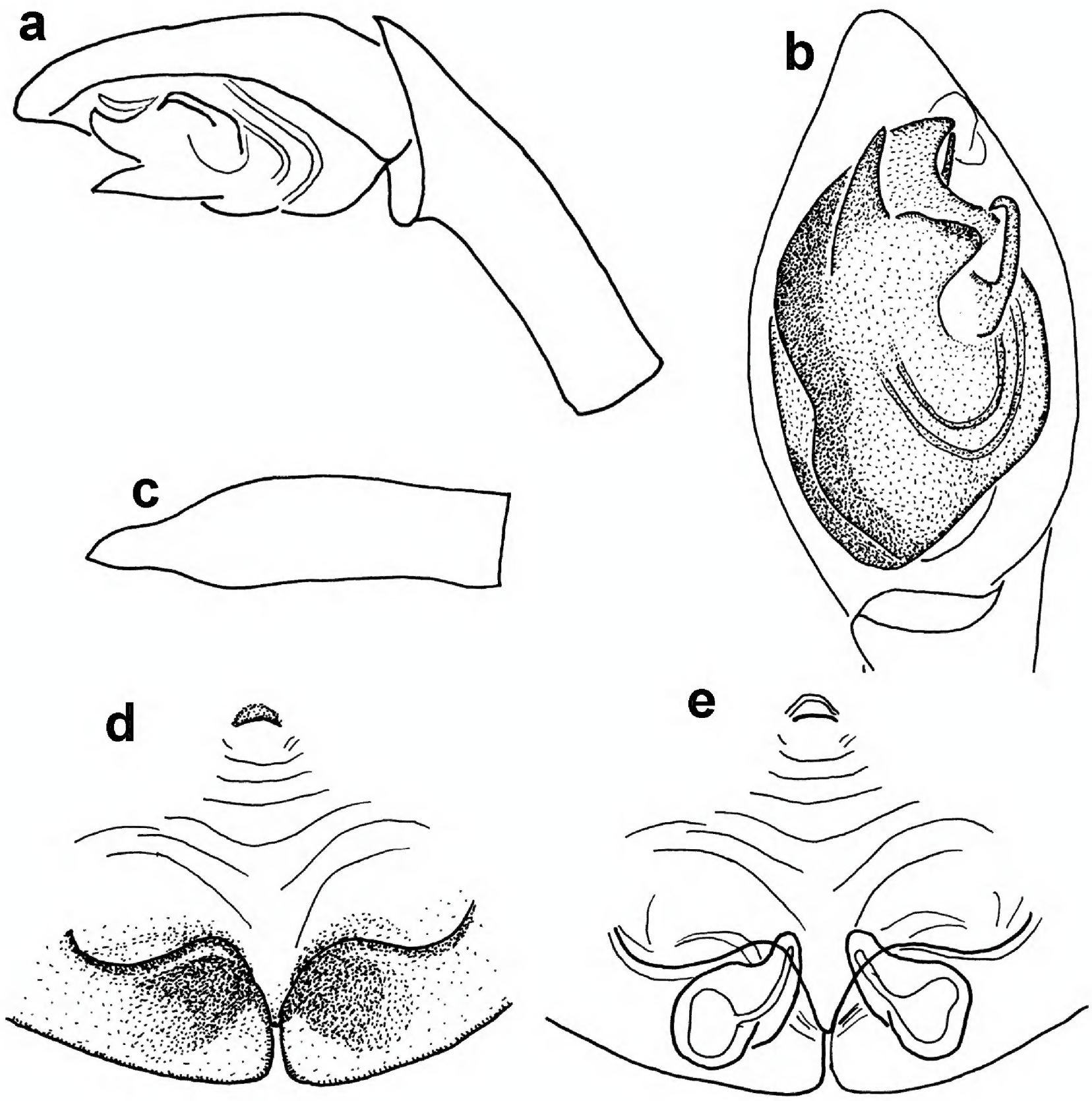

Fig. 2. a-e. *Mesiotelus tenuissimus* (L. Koch, 1866). a-c. ♂ palp. a. lateral view. b. ventral view. c. palpal tibia, dorsal view. d. ♀ epigyne, ventral view. e. ♀ vulva, ventral view.

Comment

The holotype female of *Mesiotelus alexandrinus* (Simon, 1880) could be compared with females of *Mesiotelus tenuissimus* (L. Koch, 1866), captured together with male, and it appears they are identical.

Comparative material examined from Egypt

Several specimens of *Mesiotelus tenuissimus* collected from different localities of Egypt and mentioned in the theses of Medany (2013), Elnamrouty (2014), El-Gendy (2016), Zaher (2016), and the paper of Obuid-Allah *et al.* (2017) were examined and identified by the second author.

Distribution

Circum-Mediterranean: Portugal, Spain, France, Italy, Malta, Albania, Croatia, FYR Macedonia, Bulgaria, Greece, Turkey, Israel, Yemen, Turkmenistan, Egypt, Libya, Tunisia, Algeria, Morocco.

Map 1. Distribution of *Mesiotelus tenuissimus* in Egypt.
1. Alexandria 31°12'N, 29°55'E
2. Edko 31°18'N, 30°18'E
3. Ashtoum El-Gamil 31°17'36.90"N, 32°11'4.30"E
4. Serabium, Ismailia 30°29'27"N, 32°14'29"E
5. Badr district 30°36'45"N, 30°37'34"E
6. Shebin El-Kom 30°33'23.48"N, 31°01'24.08"E
7. El-Khatatba 30°21'43.66"N, 30°48'50.93"E
8. El-Sadat City 30°20'57.20"N, 30°31'44.88"E
9. St. Catherine 28°33'35"N, 33°56'48"E
10. Assiut 27°11'N, 31°11'E
11. El-Wasta village 27°10'07"N, 31°13'52"E
12. El-Wadi El-Assiuty 27°07'43"N, 31°21'15"E
13. Sidfa city 26°57'49"N, 31°22'44"E

Distribution of *Mesiotelus tenuissimus* in Egypt (El-Hennawy, 1990, 2017):

Pickard-Cambridge (1876) recorded an adult female *Mesiotelus tenuissimus* at Alexandria. The second author examined this female (B 298, t. 106) and a male (B 299, t. 43) in the collection of Pickard-Cambridge in Oxford University Museum of Natural History in July 1997.

Simon (1880) described *Liocranum alexandrinum* from Edko near Alexandria. He described the female (cephalothorax length 2.5 mm, abdomen length 4 mm) that was later transferred to *Mesiotelus* by Roewer (1955).

Mesiotelus tenuissimus was also recorded from: St. Catherine region, southern Sinai (El-Hennawy, 2002), Serabium desert region, Ismailia governorate (Medany, 2013),

Ashtoum El-Gamil protectorate, near Port Said (Elnamrouty, 2014), Shebin El-Kom, El-Khatatba, and El-Sadat City, Menoufiya governorate (El-Gendy, 2016), Badr district, El-Beheira governorate (Zaher, 2016), Sidfa city, farm of Assiut University, El-Wadi El-Assiuty, and El-Wasta village, Assiut governorate (Obuid-Allah *et al.*, 2017) (Map 1).

Acknowledgments

Pierre Oger (Belgium) is thanked for the photos of *Mesiotelus tenuissimus*, Christine Rollard (Paris) and Jan Beccaloni (London) for the loan of type specimens from their Museums. Malgosia Atkinson (Oxford) kindly admitted for examination of specimens in the collection during the second author's visit in 1997.

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